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Machine Shop

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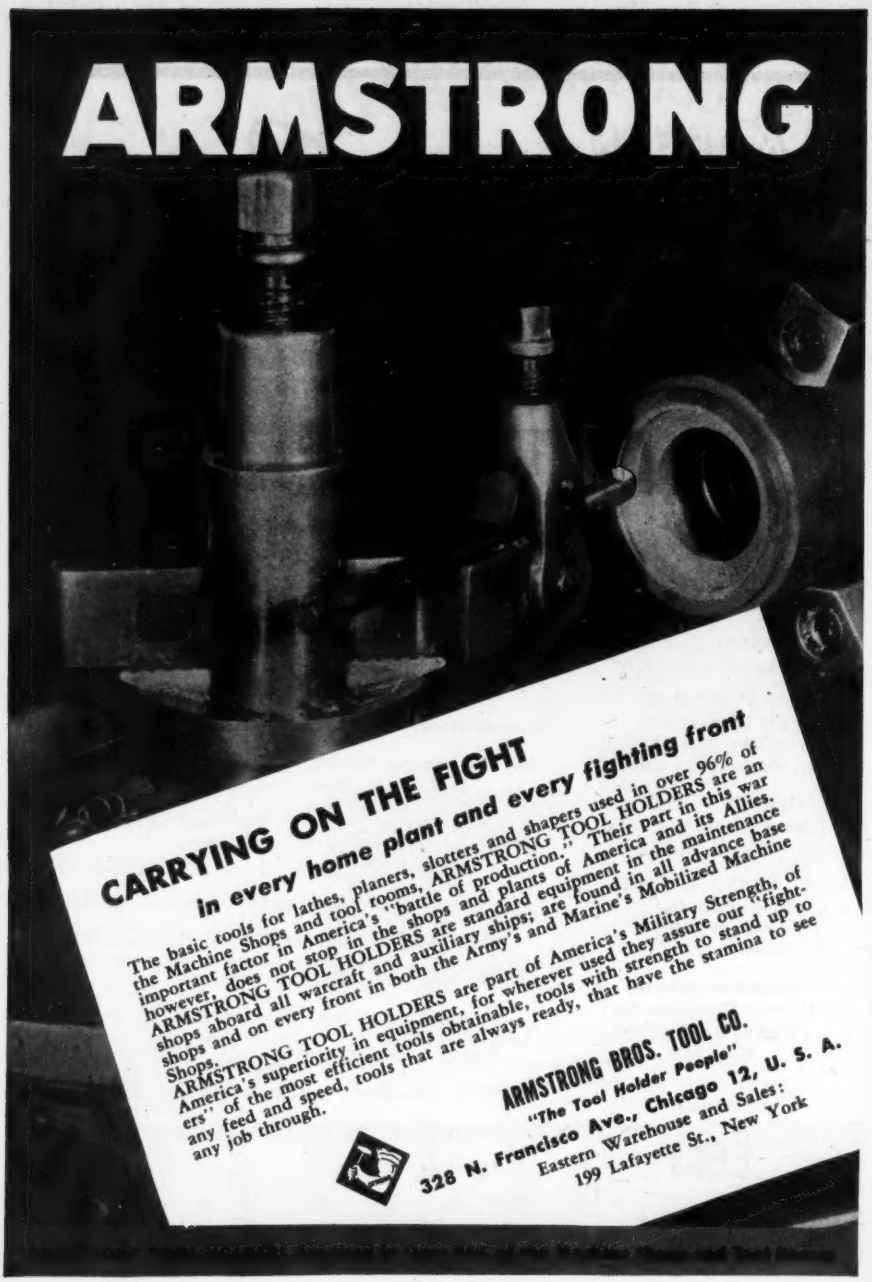
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MODERN
Machine Shop

MAY, 1944 VOL. 16, NO. 12

CINCINNATI, OHIO

We Present---

— as the feature article in this month's issue — an outline of the principal operations performed in General Electric's Fort Wayne plant in manufacturing one of America's most important weapons — the airplane engine turbosupercharger. Developed by Dr. Sanford A. Moss, Consulting Engineer, General Electric Company, and the Army Air Forces, the particular turbosupercharger dealt with in this article is responsible for the superior performance of many American planes, including the Consolidated B-24 Liberator, Boeing B-17 Flying Fortress, Republic P-47 Thunderbolt, and Lockheed P-38 Lightning.

— on page 140 — an article telling of the exceptional program of job-adjustment for women workers which has been instituted by Consolidated Vultee Aircraft Corporation in most of its divisions. The program includes the provision of competent women counselors who act as assistants to the department foremen in ironing out troubles that develop on the jobs to which women workers are assigned.

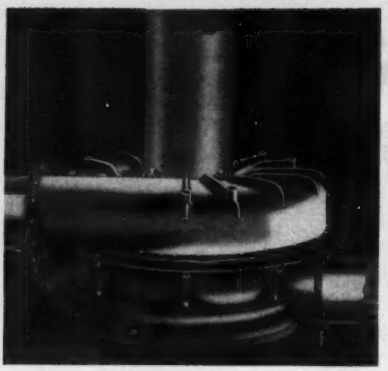
— on page 160 — a discussion by John E. Hyler of the methods, technique, and equipment employed in the balancing of rotating parts for smooth running at high speeds. Supplementing the text are numerous illustrations.

— on page 196 — "Mexican Trade Trainees Earn While They Learn" — an article telling how many promising young Mexicans are now receiving, or will receive, technical training in the mills and factories of the United States as a part of the Inter-American Trade Scholarship program. The process of selecting the candidates for such training is clearly discussed.

— on page 206 — Roger W. Bolz's "Used Ball Bearings Perform Vital War Duty!" In this article, Mr. Bolz outlines a procedure whereby ball bearings that have become too badly worn to be of use in high speed or precision machines can be applied to machines which operate more slowly, or used to replace sleeve bearings which have themselves become too badly worn for further utility where precision is not a prerequisite.

— on page 212 — the usual excellent assortment of "short-cuts" and "kinks" from our readers, followed by the "New Shop Equipment" section and other features.

— a reminder that the 5th War Loan drive will begin in June. Take this occasion to back the invasion!



An outline of the principal manufacturing operations on one of America's most important weapons — the airplane engine turbosupercharger

Building Superchargers at General Electric Ft. Wayne Plant

By HOWARD CAMPBELL
Editor, Modern Machine Shop

FROM the glowing accounts of the performance of our air arm of the service, the American public has been pretty well impressed with the superiority of both American pilots and American planes. The superior performance of the pilot is, of course, the natural result of spirit that can develop only in a free country such as America. But the superior performance of the plane can be credited in many instances to an accessory unit on the engine which makes it possible for that engine to develop unusually high speed in moments of emergency and to fly as effectively at high altitudes as it does at low. It is about this accessory, known as a "turbosupercharger," that we wish to talk in this article.

Turbosuperchargers of various designs have been developed by both German and British designers but the turbosupercharger that is responsible for the superior performance of many American planes, including the Consolidated B-24 Liberator, Boeing B-17 Flying Fortress, Republic P-47 Thunderbolt, and Lockheed P-38 Lightning, was developed by an American designer—Dr. Sanford A. Moss, Consulting Engineer, General Electric Company, and the Army Air Forces.

It is well known that, as an internal combustion engine such as an air-

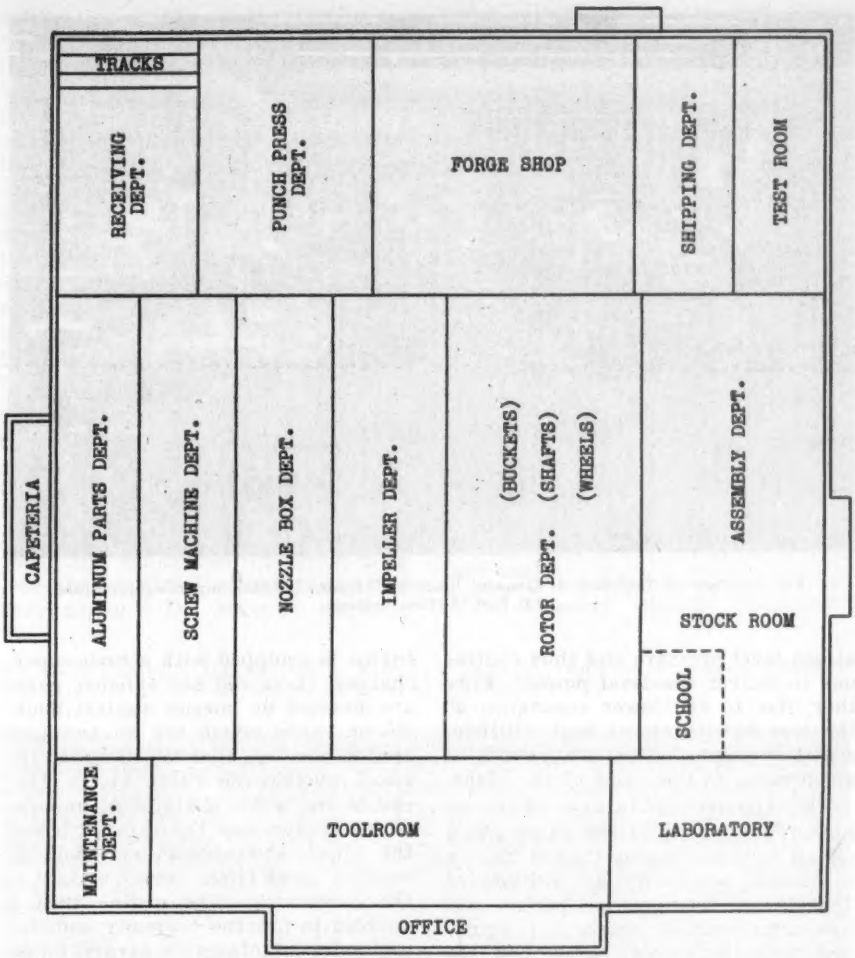


Fig 1—Plan Drawing of General Electric Company's Supercharger Manufacturing Plant at Fort Wayne, Indiana

plane engine is moved from sea level to higher altitudes, the power of the engine diminishes with the increased height above sea level, due to successively lower atmospheric pressures which prevail at those altitudes. The airplane engine turbosupercharger is so designed that, as the plane ascends to the successively lower atmospheric pressures at high altitudes, the exhaust gases from the airplane engine drive a turbine wheel connected to a centrifugal compressor impeller which compresses the low pressure air of altitude and supplies it at sea level pressure at the engine intake manifold. Regardless of altitude, the engine receives its charge



Fig. 2—View of Toolroom at General Electric Company's Turbo-supercharger Plant at Fort Wayne, Indiana

at sea level pressure and thus continues to deliver sea level power. Further, due to the lower resistance of the low density air at high altitude, sea level engine power also results in an increase in the speed of the plane.

The thinner air which exists at higher altitudes has the same effect on an airplane engine that it has on a human being. At an altitude of 18,000 feet the average person will lose consciousness, unless he is equipped with an oxygen tank. At the same altitude an aircraft engine loses more than half its power, which is reflected in a sharp drop in the speed of the plane. The turbosupercharger offsets this atmospheric condition and practically persuades the engine that it is flying at sea level.

The operation of the supercharger is easily explained. The waste gases coming from the exhaust manifold of the engine are normally allowed to pass into the outside air. When the engine is equipped with a turbosupercharger, these red hot exhaust gases are directed by nozzles against buckets or vanes which are so arranged around a wheel that the force of the gases revolves the wheel. At the other end of the wheel shaft is an impeller which compresses the rarefied air of the upper atmosphere and thus directs a good, rich "shot" of air to the carburetor. The engine then is enabled to breathe normally and consequently maintains its normal horsepower.

The exhaust gases emanating from the engine are approximately 1,600 deg. F., while the temperature at the other end of the shaft, some 12 inches away, may be 67 deg. below zero F. The shaft, carrying the turbine at one end of the shaft and the supercharger impeller at the other end of the shaft, revolves at a speed of many thousands of revolution per minute.

Another advantage inherent in the

application of the turbosupercharger consists in that "absolute" pressures in the intake manifold at altitudes appreciably above sea level are easily possible. This means that for a few seconds the speed of the engine can be greatly increased, although this increase could not be maintained for long due to the intense heat that is developed. But this momentary extremely high speed, which is called "boost," can be utilized in critical moments by pilots to obtain advantages over the enemy. Thus the turbosupercharger has played no small part in American air supremacy.

Dr. Moss was interested in gas turbine design while studying as a graduate in engineering at Cornell University. His research on the gas turbine comprised the thesis subject for his doctor's degree, which he received in 1903. The subject so interested General Electric Company executives that they engaged Dr. Moss to continue his research. During the first World War, in cooperation with engineers of the Army Air Forces, he worked on the development of a turbine to be driven by the exhaust gas of an airplane engine to supply the power for a centrifugal compressor which, in turn would supply air at normal atmospheric pressure to the carburetor of an airplane motor. In September, 1918, Dr. Moss took a 350 h.p. Liberty motor to the top of Pike's Peak—14,000 feet high—where the lowered atmospheric pressure reduced the horsepower of the Liberty motor to 230. With the turbosupercharger in use, the power of the engine went up immediately to 356 h.p. Today most American war planes are equipped with the turbosupercharger, and the General Electric Company has built a huge plant at Ft. Wayne, Indiana, for the manufacture of these important units.

The General Electric Company's

Fig. 3—View through Automatic Screw Machine Department. Machines are largely hidden by Stock, but Arrangement of Department can be Seen





Fig. 4—Conveyor Line Between Two Rows of Automatic Machines

Ft. Wayne turbosupercharger plant is the largest single building of all the General Electric new war-time factories and, with its equipment, representing a defense plant corporation investment of approximately $25,000,000 covers a plot of (deleted by censor) square feet. In it turbosuperchargers are manufactured under full line production methods. The plant operates on three shifts with more than 3,000 employees, of which 67 per cent engaged in war production work are women.

With the exception of a small nucleus of instructors, practically all the people in the plant were trained within a year for this work; work which must be done with a degree of precision far greater than that which prevails in the average machine shop. Twenty-two weeks from the time the first woman was instructed for a man's war work job the training of the one-thousandth woman had been completed. When it is considered that a supercharger must be built to withstand temperatures as extreme as 67 deg. below zero on one side and 1,500 deg. above zero on the other side, with only 12 inches between them, and that the unit operates at a speed of (deleted by censor) r.p.m., one can appreciate the magnitude of the task.

The plant building is practically square in shape, and is designed so that it can be completely blacked out. The offices are so designed that, if necessary, one-half of the offices can be lighted and the light will not be visible from the outside. An even temperature is maintained in the plant at all times, arrangements having been provided for in the air conditioning system to compensate for coolness at night and for heat caused by the operation of the machines, from the operation of lights, and



Fig. 5—View of Impeller Department from one End. Each Impeller is Moved on its own Tray, to Avoid Damage

from other plant equipment.

Extending across the front of the plant, immediately behind the office, are two large sections, one of which is devoted to toolmaking and maintenance, the other to laboratory and test. A wide aisle separates this section from the manufacturing departments which occupy the main section of the building.

The manufacturing departments and production lines are laid out parallel with the sides of the building and at right angles to the toolroom and laboratory. Beginning at one side of the building, the machining departments are laid out thus: aluminum parts department, screw machine department, nozzle box department, impeller department, rotor department (including buckets, shafts, and wheels) and, at the opposite side of the building, the assembly department and an adjoining stock room. A school for training operators is also set up in one corner of this last department.

Across the rear end of the machining and assembly departments is another wide aisle extending from side to side. A solid wall also extends across the building at this point, separating all of the major part of the building from the receiving department, punch press department, forge shop, shipping department, and test room, which are set up in the rear section of the building. A railway spur extends into the building at the receiving department side so that cars carrying materials can unload directly into the receiving department.

An addition to the building on one side contains the cafeteria, with a section for lavatories. A similar but smaller addition built onto the other side of the building contains additional lavatories. Roller conveyors

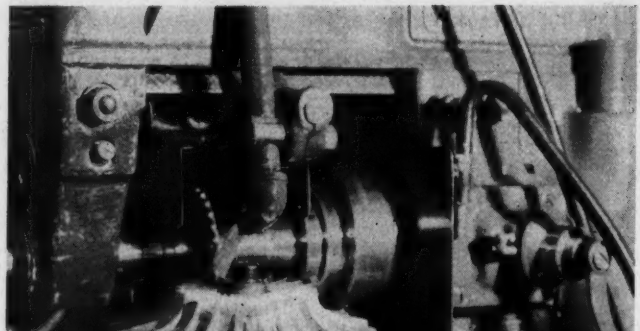


Fig. 6 — Rough Machining Vanes of Impeller, Which is done on a Cincinnati Horizontal Milling Machine

have been incorporated into the plant layout wherever they can be useful for conveying materials from one machine to another or from a department where they are machined to a department where they are used.

The entire plant is lighted by a system of fluorescent light units which provide a high level of illumination at the machine and bench. Supplementary lighting units are used wherever such units are necessary to illuminate fine or close work. Floors are of creosoted wood blocks.

A view of the toolroom is shown in Fig. 2. Considering that this picture was taken without any previous notification to the department head, it is interesting to note the clean, well-kept appearance of this department.

The illustration Fig. 3 shows an aisle extending through the automatic screw machine department. Very little can be seen of the machines, due to the interference of the stock holders and piles of stock. Halfway down the aisle can be seen one of the power driven extension ladder trucks, at the moment in use by a maintenance workman who is replacing one of the fluorescent lighting tubes.

Another conveyor line between two rows of automatic machines is shown in Fig. 4. There is nothing exceptional about these views of the plant except that they show the perfect alignment of the machines, the efficiency of the lighting system, the manner in which the roller conveying system has been set up to serve the machines, and the general appearance of good housekeeping and efficiency that prevails throughout the plant.

In Fig. 5 is shown one end of the impeller department, with stacks of the impeller forgings on both sides of the conveyor. To move the impellers from one machine to the next without running any risk of their becoming damaged through contact, each impeller is placed on one of the wooden trays which can be seen part way down the conveyor line. The trays in sight are empty, but the manner in which they can be stacked one on top of another can clearly be seen.

The first operation in the machining of the impeller is to drill and ream the hole through the axis. Using this as a locating point, in the next operation the O.D. of the impeller is

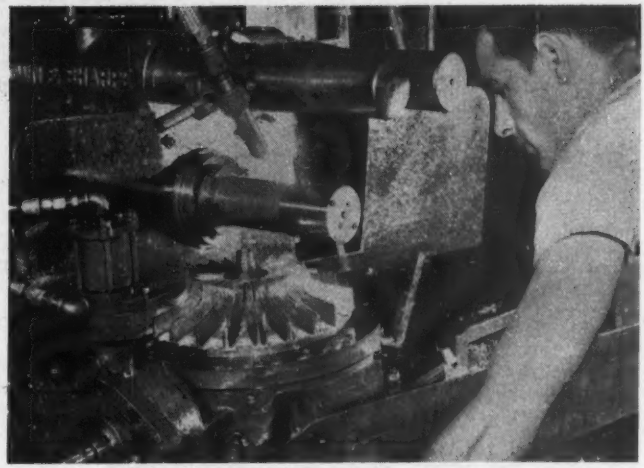


Fig. 7 — Triangular Pads of Metal between Impeller Blades are Removed with Fly Cutters. The Impeller is Held on a Fixture which Oscillates as Required to "Clean Up" the Space between the Vanes

turned and the hub is faced.

The next operation is the rough machining of the vanes, which is done on a horizontal milling machine as illustrated in Fig. 6. The proper location for the rough milling of each impeller blade, in turn, is obtained by the very simple expedient of using a spring plunger with a nose which is tapered so that it will fit snugly between the two nearest vanes.

In the next operation, Fig. 7, the impeller is located on a fixture on a similar horizontal milling machine and fly cutters are used to remove the triangular pads of metal which are left between the blade faces after rough machining with the milling cutter. The fixture is so designed that the mechanism, operated by oil, oscillates from side to side during the cutting operation just enough so that the tool will "clean up" the space between the vanes. Considering that the land to be machined tapers down to a point, the difficulty in machining this with an ordinary cutter and the advantage inherent in the use of the oscillating fixture and fly cutters are immediately apparent.

The illustration Fig. 8 is another view of the fly cutters mentioned in the previous paragraph. The cutters, each of which is tipped with Carboloy, fit into slots provided for them in a cylindrical toolholder, where they are

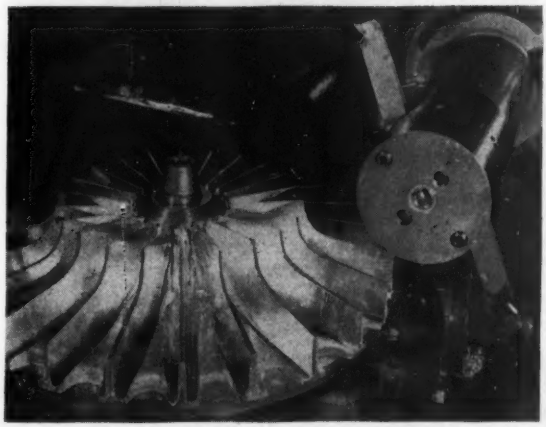


Fig. 8—Close View of Cutters shown in Fig. 6. The Cutters are Tipped with Carboloy

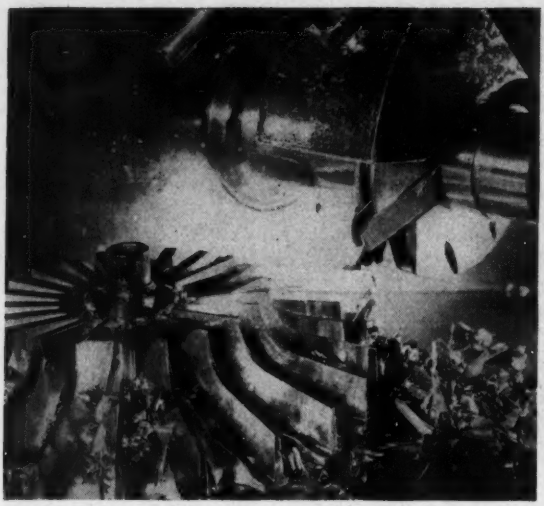


Fig. 9—The Impeller Blades are finished with Fly Cutters which Operate in Pairs, the Blades being ground to Provide the Necessary Taper

locked with headless set screws.

The finishing operation on impeller blades, shown in process in Fig. 9, is performed with a fly cutting tool somewhat similar to that used for machining the land between the blades, excepting that in this case a pair of cutters is used set with just enough clearance between them to provide the proper thickness to the blade. Inasmuch as each vane is thicker at the base than at the top, the cutters are ground at an angle to provide the necessary taper. When all of the blades have thus been finished to size, the sharp edges are removed and the tool marks are polished out.

The design of the supercharger impeller specifies a curve, on a definite radius, at the top of each vane. The curving operation, which is shown in Fig. 10, is performed in a vertical hydraulic press, equipped with a fixture which holds the impeller rigidly while the curving operation is performed. The fixture also carries a forming plate against which each vane is brought to bear, in turn, as the punch, which is curved slightly so as to roll the upper edge of the vane over the form, is forced downward. With the impeller always held to the same position for the successive blades, and with the same punch bearing down to the same position, all blades are curved alike.

A view of an impeller in position

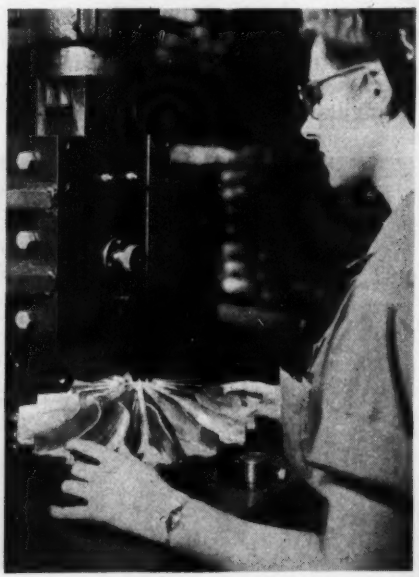
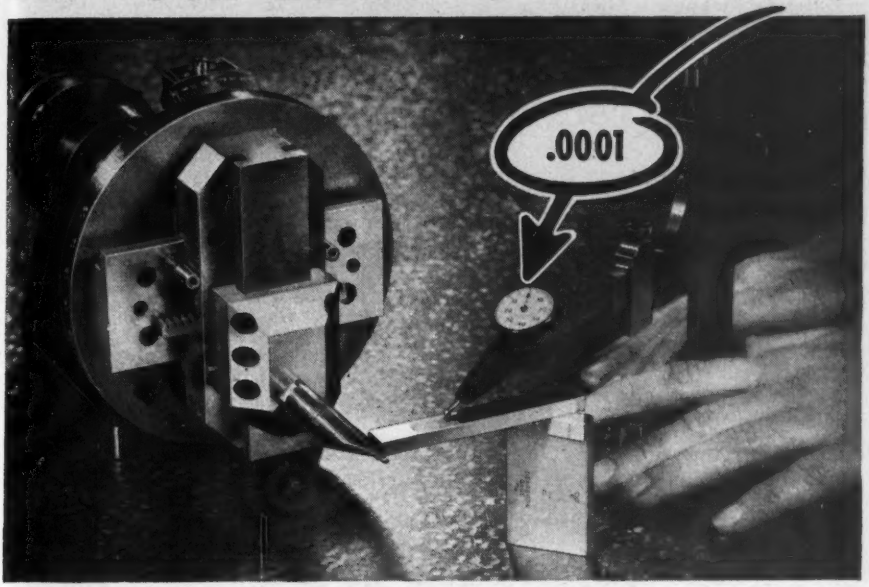


Fig. 10—The Blades are Curved as Required by the use of a Curved Punch, the Blades being Supported by a Curved Forming Plate

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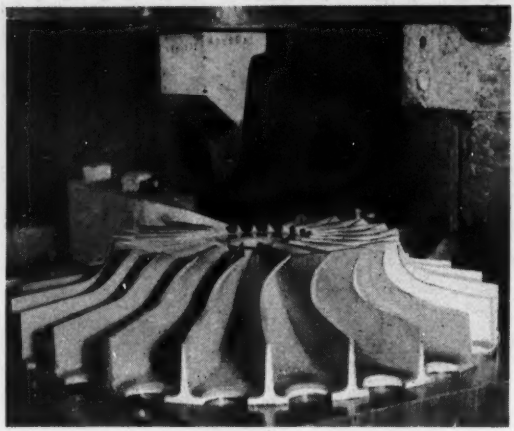


Fig. 11 — Close View of Curving Punch, with Impeller in Position for Curving

for the curving operation, together with the tools, is shown in Fig. 11. Although of simple design, the punch does a perfect job of rolling tops of the vanes to the specified contour. The hydraulic pressure is steady and smooth; perfect for this application.

(The Second Half of the Article will be Published in the June Issue)

Shotgun Shells Start Airplane Motors

Shotgun shells have been substituted for storage batteries to start airplane motors during testing. This believe-it-or-not use of a variation of the humble shotshell to "shoot" airplane engines into starting, was revealed today by Thomas I. S. Boak, works manager of the Winchester Repeating Arms Co., a division of Western Cartridge Company, which is manufacturing shotshells of this type.

Where a storage battery provides a continuous flow of electrical energy to operate an engine starter, the shotshell delivers a single powerful impulse which starts the motor, according to Mr. Boak.

The airplane starter cartridge is longer, but similar in appearance to a standard shotshell. Placed in the starter mechanism, the cartridge is fired electrically by an ingenious fuse assembly located in the head of the shell. Conventional shotshells are fired by percussion when the firing pin of a gun strikes the primer.

In starting an airplane engine with a shotshell starter, electrical current ignites the charge of black powder in the shell and releases powerful gases which set the starting mechanism into operation. Winchester makes the shells in four sizes.

Smaller War Plants Corporation Services to Small Manufacturers

Continuing its campaign to aid small manufacturers suffering from production headaches, the Smaller War Plants Corporation has prepared a booklet summarizing the services small manufacturers may receive.

This booklet describes the organization of the Technical Advisory Service and the cooperative plan by which assistance is obtained. It outlines procedure through which Smaller War Plants Corporation will assist businessmen in evaluating and obtaining access to patents held by the Alien Property Custodian and the possible new products and inventive ideas submitted to other governmental agencies.

Copies of the booklet may be obtained from any of the 115 SWPC field offices or from: Technical Advisory Service, Smaller War Plants Corporation, HOLC Building, First and Indiana Avenue, Washington 25, D. C.

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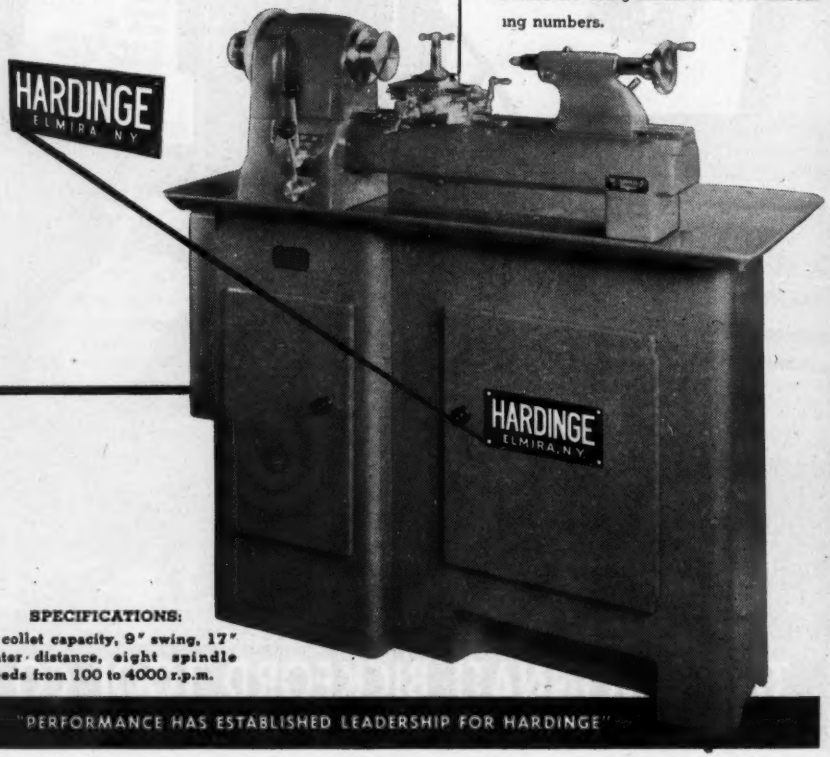
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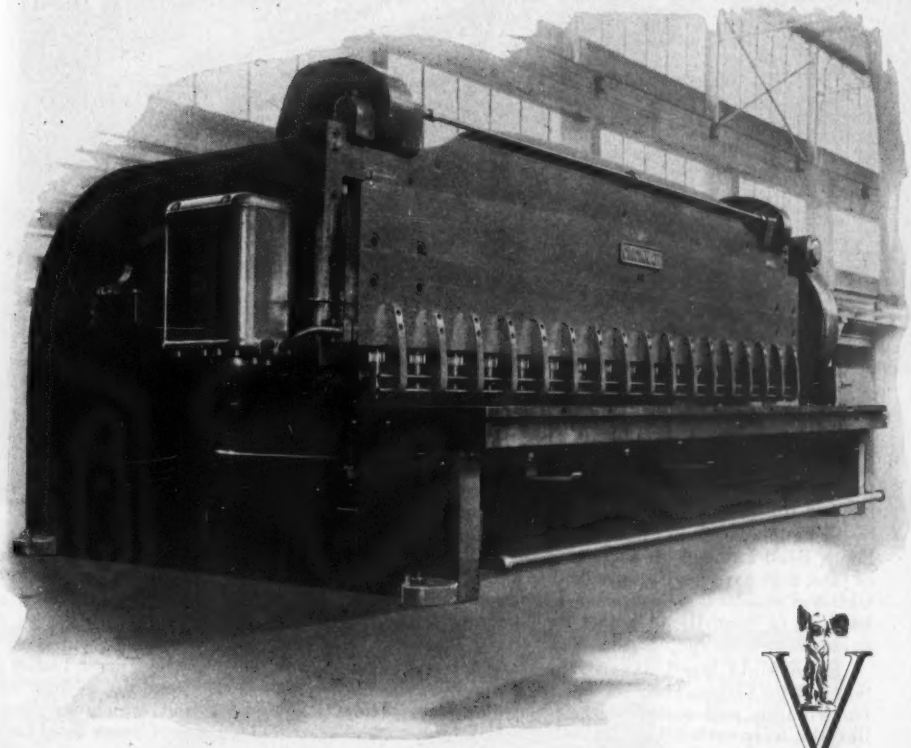
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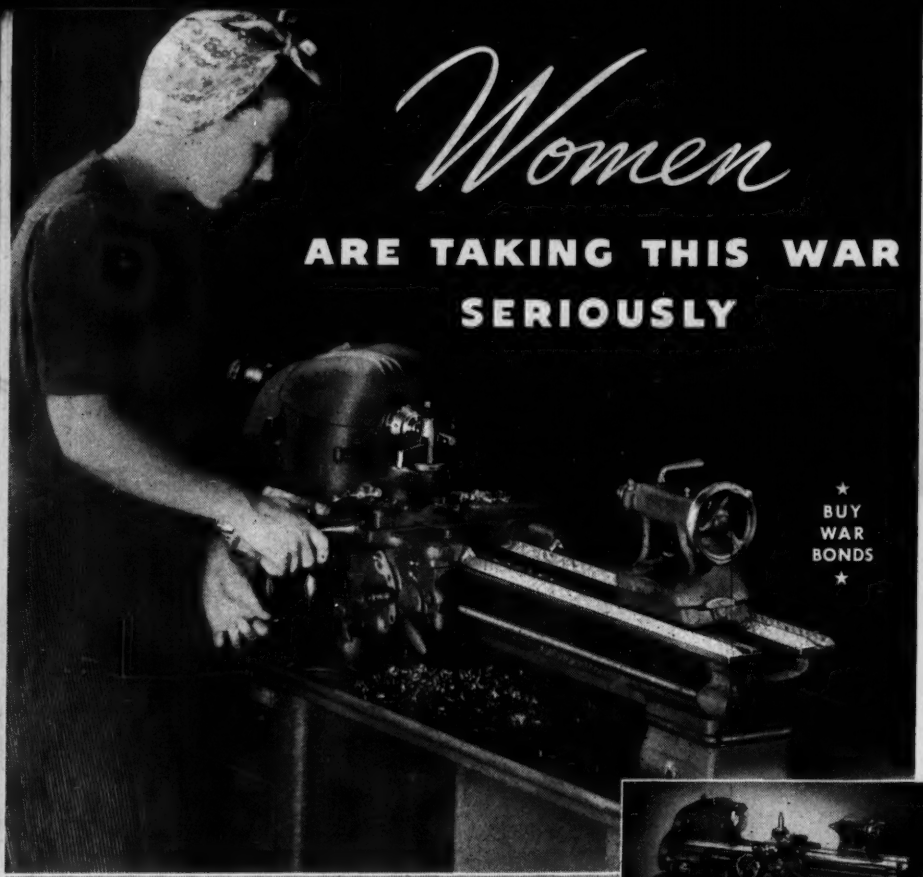
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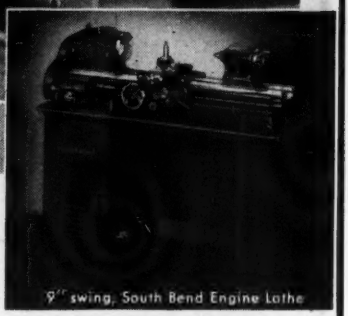
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Since World War I, women operators have preferred South Bend Lathes. Their nimble fingers find the convenient controls well suited to their sensitive touch. They like the fully enclosed design. And, they appreciate the ease of operation that prevents fatigue and makes the workday seem shorter.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″ to 16″ swings, with 3′ to 12′ bed lengths. The Turret Lathes are made with 9″ and 10″ swings. Write for Catalog 100C which describes all sizes and types of South Bend Lathes.



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The drill illustrated is the CP No. 806 "Midget"—ideal for close quarter drilling jobs up to ¼".

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"Machine shyness" is characteristic of women workers when they are first assigned to dangerous-looking machines such as the bandsaw shown here.

Counselors Help Find Answers

to problems of women workers at Consolidated Vultee Aircraft Plant

By PHYLLIS GANDEE
Consolidated Vultee Aircraft Corporation

THOUSANDS of women from all walks of life, previously unskilled in the mechanical arts, are now building weapons of war in America's industrial plants. In a little more than two years the nation's industrial managers have learned how to cope successfully with the problems presented by the mass employment of women. The development of new codes and new techniques which have made it possible for mothers, young girls and older women to come into factories and to learn all types of machine operations, bench work, and assembly tasks, is a remarkable achievement.

The usual method of absorbing women into a factory organization is to hire them and then simply train them for such tasks as they seem able to perform, but Consolidated Vultee Aircraft Corporation has gone into the matter much deeper than that. Consolidated has instituted an exceptional program of job-adjustment for women workers, and throughout most of the divisions of the corporation competent women counselors are provided to handle the problems incidental to the adjustment of the women to their jobs.

The counselors act as assistants to the department foremen in ironing out troubles that develop on the jobs to which women workers are assigned. They maintain close contact with the women employees both on the assembly lines and in the fabrication departments. In addition to the problems peculiar to the tasks, many personal problems are also solved with the aid of the counselors and their helping hands and words of advice often keep the women on their jobs.

At Consolidated Vultee San Diego division, the counseling program operates efficiently with a chief counselor heading an organization of forty counselors. The women assigned to buildings in the plant on both day and night shifts have offices in the factory where feminine employees may go to consult with them at any time.

New women workers are ushered into their first day of employment with



In their private factory offices, "Convair" counselors help to work out the job and personal problems of the women workers.

"Convair" (Consolidated Vultee Aircraft) through an induction program designed to acquaint all employees with safety rules, company regulations and procedures. Women are advised confidentially on personal matters by a counselor who later takes them on a tour of the buildings to which they have been assigned. They learn how to punch time clocks and are shown the locations of first aid stations and restrooms. On these tours, a counselor has an opportunity to talk to the new women employees who will be working in her building. Counselors offer help to each feminine employee with any problems that may arise.

When a new woman employee is assigned to a job, the counselor in her department checks with her foreman to make sure that the job is within the physical capabilities of the new worker. All Convair employees are physically "coded"" at the time of employment to determine what types of work they are able to do, and the factory jobs are coded as to physical requirements. In checking with foremen on jobs assigned to women, counselors refer to the medical codes on employee records.

When counselors and foremen discover that a woman has been given work not in accordance with her code, the foreman makes necessary adjustments by transfering the employee to another job or switching work with some other department member.

Many women appear to be in excellent physical condition, but examinations reveal limitations. For example, one young girl was anxious to learn to

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The majority of the tasks in Convair's rivet-sorting and rivet-packaging department, shown above, are performed by older women whose physical codes are such that they must be given sitting jobs.

be a drill press operator. She did not meet physical requirements for this type of work and the company sent her to a stock room as a clerk. The girl was disappointed, but she remembered that the counselor had offered to help her with problems, so she went to the counselor's office and confided her trouble.

The counselor checked the physical code of the girl and discovered she had a sensitive skin. The older woman explained that operating a drill press would have aggravated the skin condition because of the more or less constant spray of oil from the machine on to her hands. The girl was relieved to learn the reason why she wasn't sent to a drill press, and assured the counselor that she would transfer her affections to the new job.

Determining whether or not their jobs are suitable for women who started work at Convair prior to the adoption of the medical department physical coding program is a difficult task. Counselors often discover job misplacements through interviews with female employees.

Mrs. Jones, a mother of four children, was assigned more than a year ago to the Liberator wing department. Here the incessant chatter of rivet guns is interrupted only during rest periods and lunch time. Mrs. Jones told the counselor she liked the work but complained that the noise was bothering her.

The counselor suggested she be given a physical examination and coding, since the company had no record of a physical coding. The examination

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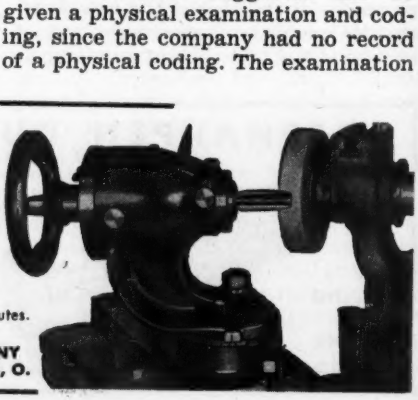
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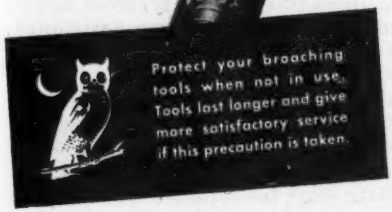
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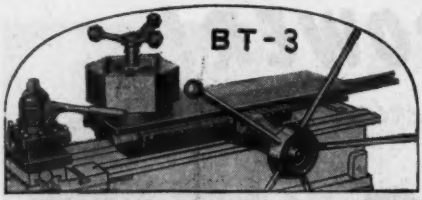


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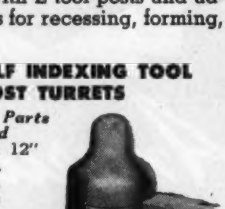
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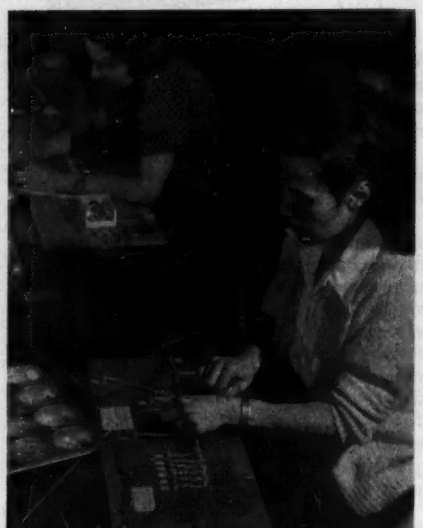
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revealed Mrs. Jones was highly nervous, and the noise obviously was aggravating her nervous condition. The counselor explained the situation to the foreman, who transferred Mrs. Jones to a quiet bench department where she works now on small assemblies.

Such adjustments as that of Mrs. Jones are important both to the company and to the individual concerned. Mrs. Jones brought her problem to the counselor. She was given assistance and the company profits by not losing a trained employee.



Stool and bench heights and bench widths are important considerations. Improper heights and widths of equipment were discovered to be the cause of occupational neuritis among women bench workers.

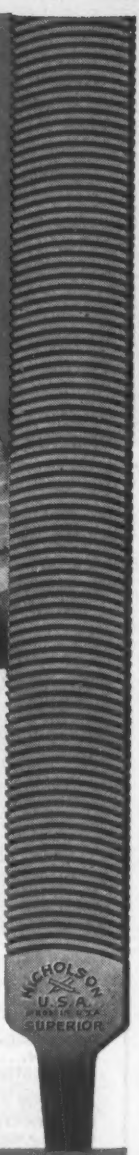
Another interesting case, discovered recently, serves to illustrate how extensive adjustments now are being made for female employees to accommodate them to factory work.

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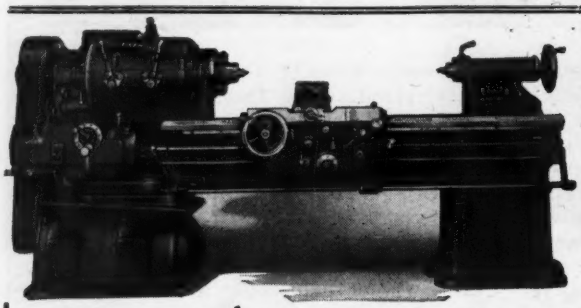
The rivet-sorting department, formerly located on a mezzanine above the machine shop and a heat treating department, employs a large number of women. Most of them fall into an older age group. Rivet-sorting requires dexterity of finger movements and women adapt themselves easily to the work. Most of the jobs in the department are sitting jobs or part-time sitting. The physical codes of women in this particular age group call for such a type of work.

The rivet-sorting operation was in progress one day when an older woman complained that the conveyor belt, which feeds rivets into a bin for sorting, made her dizzy. The foreman was contacted and the department counselor was called to the scene.

It was discovered that her bi-focal glasses focused on the conveyor belt at the wrong angle. To the older woman, the rivets appeared distorted and the jumbled mass of tiny parts moving in an endless chain before her eyes had caused the dizziness.

Further investigation into the department revealed that all the women in the older age bracket complained of the heat from the heat-treating department beneath the mezzanine on which they worked. The women agreed, too, that climbing the long flight of stairs to their department several times a day was fatiguing. The entire rivet-sorting department was moved to another part of the plant. The new street level location met with the hearty approval of the women who had been bothered by the sultry warmth from heat treating furnaces and the long climb up a flight of stairs.

Many machines are dangerous looking and machine-shyness is a common complaint with new female employees. The blade of a trim saw, for example, looks wicked to a woman who is accustomed to nothing larger than a butcher knife. The screeching sound of a



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saw cutting through sheet metal makes women nervous at first, too. But woman to woman, a feminine employee will discuss freely with a counselor her shyness of a machine. With foremen, women are reluctant to mention such problems.

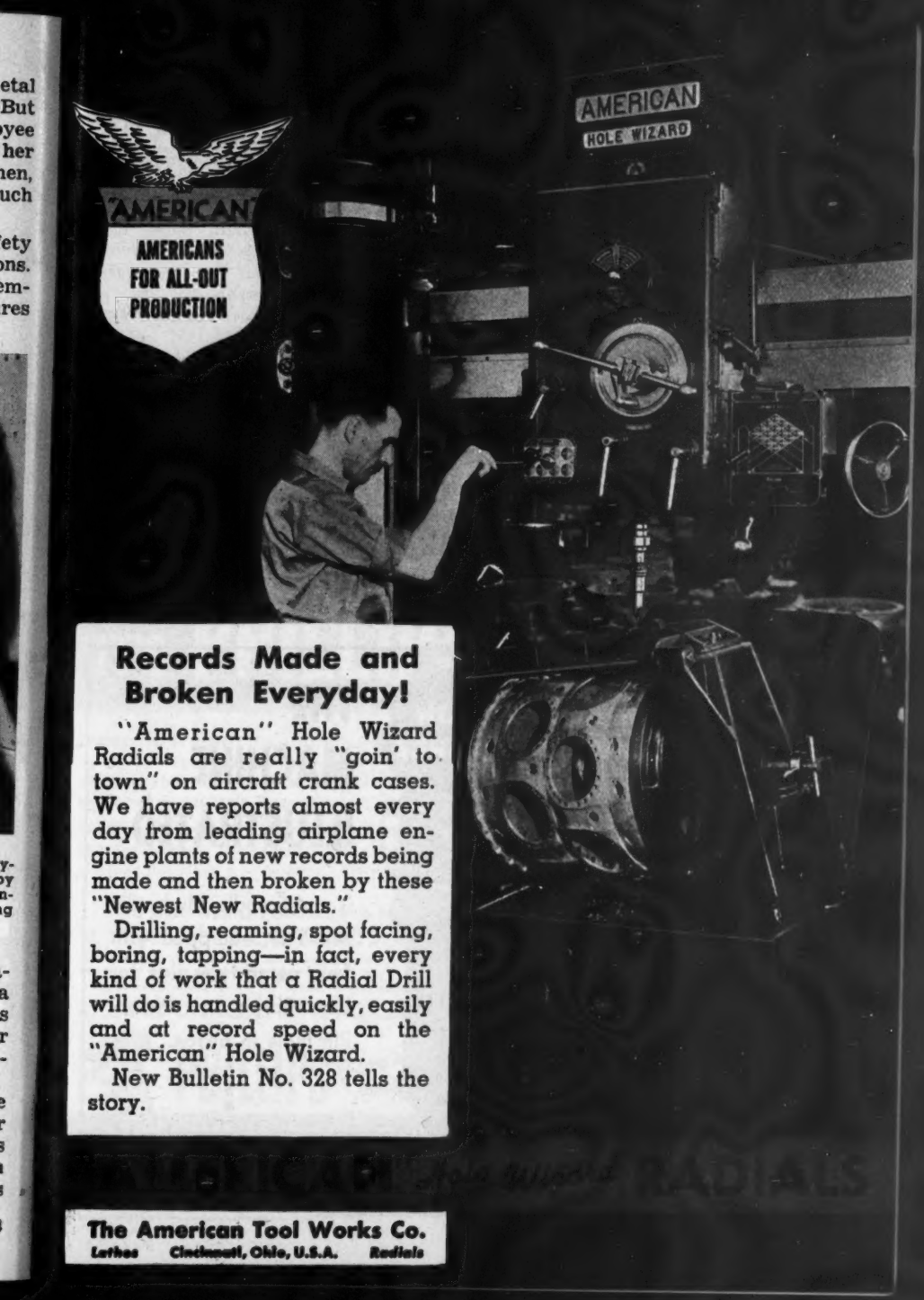
Counselors point out machine safety guards, and explain their functions. The protection ensured by the employee's adoption of safety measures



To work as riveters, women must have a physical "B" code. The "B" code, established by Consolidated Vultee's medical department, indicates women who are capable of performing moderately heavy labor.

regarding wearing apparel is emphasized. A counselor's assurance of a machine's safety relieves a woman's fears, and the attention the counselor pays to a new employee gives the woman confidence in her job.

Just as machine operators have their problems, so do women in other departments. Occupational neuritis is a complaint with women engaged in various types of bench work such as



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sub-assembly, electric, metal or radio bench. The neuritis is a soreness occuring in the back and arms. Causes of the pains have been traced to improper bench and stool heights and widths of benches.

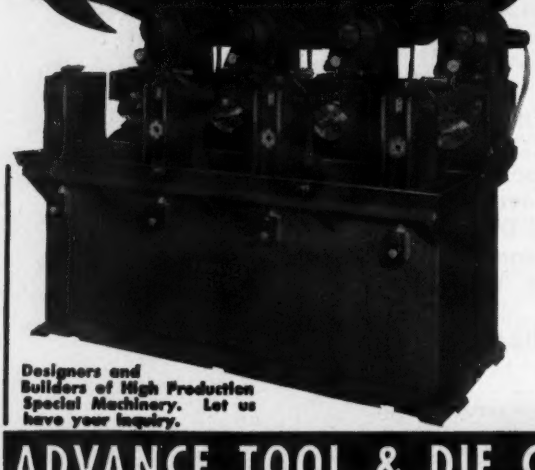
Stools and benches originally were constructed for men. Women's shorter arms and legs make it impossible for them to sit comfortably on high stools and to work at benches where they have to stretch their arms continually. When cases of occupational neuritis are discovered by counselors, they recommend to foreman necessary adjustments in heights and widths of equipment.

In giving women workers assistance with all types of problems, counselors have a vital role to perform. Their work on pregnancy cases is an important part of the counseling program.

Consolidated Vultee follows a definite procedure with women workers who become pregnant. Women must notify their counselor, or foreman, in the presence of a counselor, of the fact that they are pregnant. The employee is then sent to the medical department, where she is advised to consult a reliable physician. From him must be obtained statements indicating that she is under his care, the length of time advisable for her to continue work, and recommendations as to limitations that should be imposed on her work. Female employees are allowed to work through the end of the sixth month.

Most departments have certain types of work that may be performed by pregnant women. In the sheet metal department they run stamping and burring machines and do bench operations. In the salvage department they sort rivets. Bench departments, too, contain many jobs that pregnant women may perform. If departments have no light jobs, foremen make ne-

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A head counselor and general foreman discuss the job-adjustment of a young woman drill press hand.

cessary adjustments for pregnant women by inter-departmental loans, intra-departmental trades or by transferring women to other departments.

New women employees soon discover they must change living habits to conform to their jobs. Shift hours at one plant are from 6 a.m. to 2:30 p.m. and from 2:30 p.m. to 11 p.m. At the other plant the day shift works from 7 a.m. to 3:30 p.m. while the swing-shift hours are from 4:30 p.m. to 1 a.m.

Convair women wear slacks, sensible shoes with closed toes and heels, and head coverings; caps, turbans or a combination of hair nets and bandanas. There are many tasks which call for the wearing of safety goggles,

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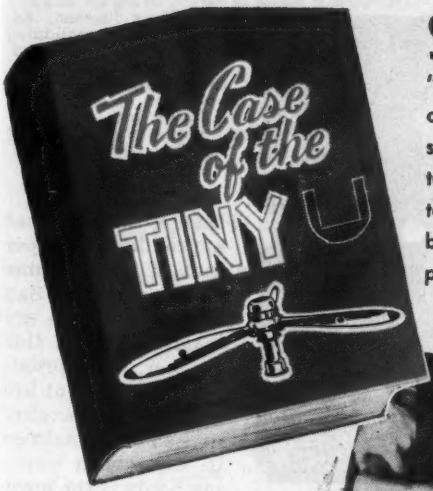
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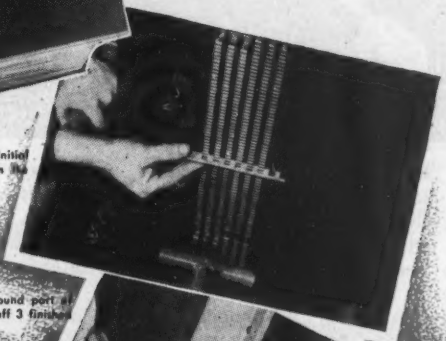
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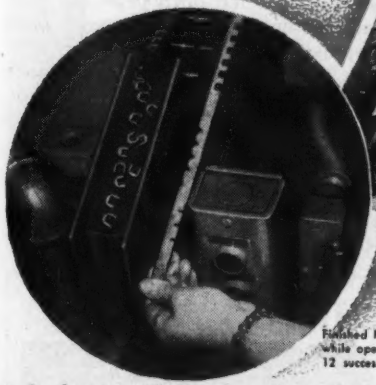


SHOWN at the left in actual size is the tiny "U" that so typifies broaching's solution of precision production problems. This tiny "U" is the spring pack retainer used in propeller blades to relieve torque stress. With capacity of 10 ton pull Lapointe designed a machine and 12 broaches to produce literally millions of these parts to fine precision tolerances.



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Then 3 more cuts form the round part of the "U" and 3 more cuts cut off 3 finished pieces.





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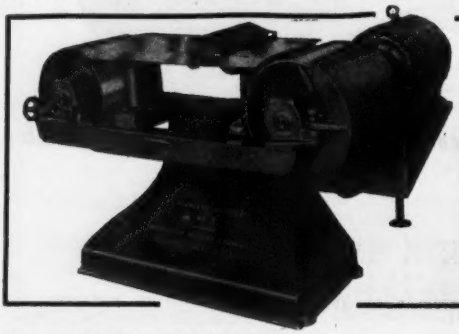
Mrs. Mary Jackson, Assistant to Consolidated Vultee Aircraft Corporation's director of industrial relations, discusses operation of a stamping machine with a 60-year-old woman employee at the San Diego Division.

masks or gloves. Clothes get greasy and oily. Hands become grimy and coarse. Fingernails break easily. Such conditions may cause a meticulous woman to become discouraged.

Counselors advise women on all matters of cleanliness and proper care of the hands and feet. Many women find it necessary to shampoo their hair oftener now. Keeping blouses and slacks clean and mended is a tedious home chore. Wearing the same type of outfit day after day is a blow to feminine vanity at first, but women soon become accustomed to it.

The adjustment of a woman's personal life is as important to the company as her job-adjustment. It has been estimated that approximately 75 per cent of the feminine employees in the San Diego division are married, and of this number, an approximate 50 per cent are mothers. Arranging household routines to agree with working hours is the most important adjustment a working housewife must make. Child care is the most vital problem facing mothers.

By maintaining close contacts with women workers, counselors are able to give assistance with problems that arise in a woman's personal life and in her work. When both personal and job adjustments are made, women employees become increasingly more efficient in their work. With women comprising approximately 45 per cent of the total number of employees at the San Diego plant, job-efficiency of feminine employees is a vital factor in maintaining production schedules of Liberator bombers and Catalina flying boats.



PEERLESS Abrasive Belt Surfacers

For speed and quality in grinding flat surfaces of metal, wood, hard rubber, celluloid and plastics. Furnished in 9", 14", and 20" sizes.

Other Horizontal and Vertical types for flat or round work can be furnished.

PRODUCTION MACHINE CO.
GREENFIELD • MASS.

8 HOURS "OVERTIME" FOR TOOLS *Free!*

SUNOCO
EMULSIFYING CUTTING OIL

PERMITS 20% LONGER TOOL LIFE . . . CHECKS RUST

Plus production will win the war . . . the kind of plus production made possible by cutting tools staying on the job longer than usual, as they did in this plant when a change was made in cutting oil.

Extra output was being retarded because of frequent tool changes . . . rusting of machined parts . . . and a tendency of the oil toward rancidity. A Sun Cutting Oil Engineer studied the conditions and recommended a change to Sunoco Emulsifying Cutting Oil.

Tool life increased up to 20% — the equivalent of 8 extra hours in every 40-hour week — when they switched to Sunoco. Sunoco also proved to be an effective rust inhibitor, solving their rusting problem . . . and showed no tendency toward rancidity.

Production increased per machine tool unit in this plant . . . and in thousands of other plants where Sunoco has been put on the job. Its high heat-absorbing and rust-preventing characteristics, plus outstanding stability, make possible longer tool life . . . increased production . . . smoother finishes . . . closer tolerances.

Call a Sun Cutting Oil Engineer to show you the advantages of Sunoco Emulsifying Cutting Oil as applied to your own plant. Write

SUN OIL COMPANY • *Philadelphia 3, Pa.*

Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

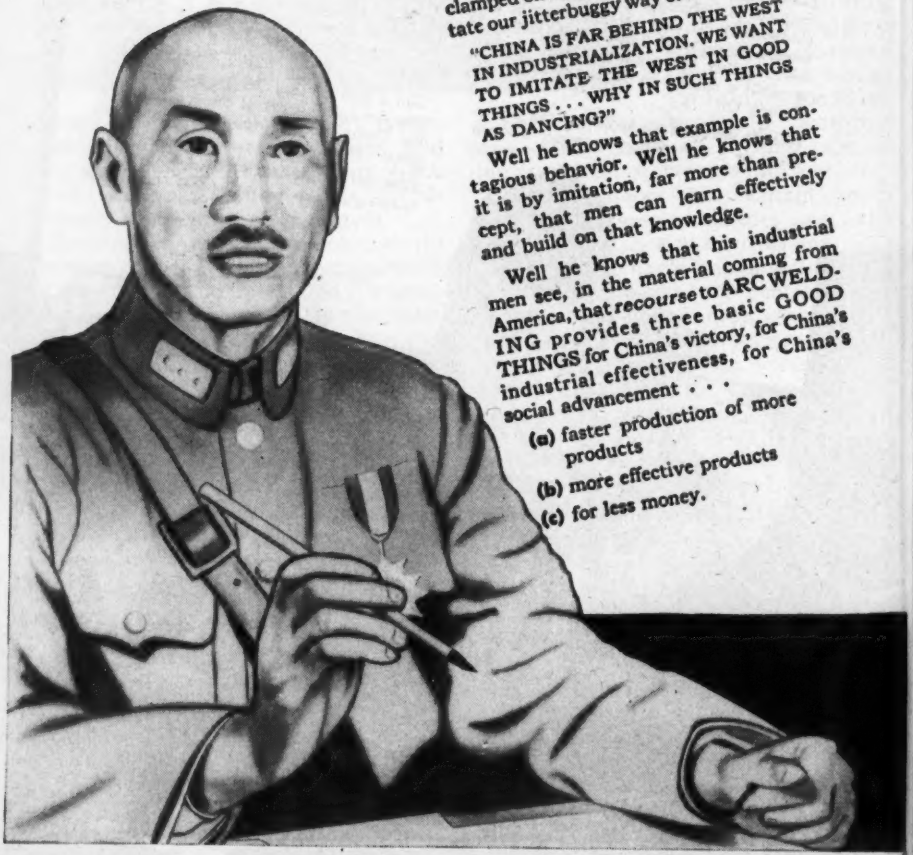


SUNOCO

SUN INDUSTRIAL PRODUCTS *HELPING INDUSTRY HELP AMERICA*

Then he said to himself—

"IMITATE IN GOOD THINGS"



THERE'S a sermon in the words of China's leader, Generalissimo Chiang Kai-Shek, as blue laws were clamped on his people's tendency to imitate our jitterbuggy way of life. Said he: "CHINA IS FAR BEHIND THE WEST IN INDUSTRIALIZATION. WE WANT TO IMITATE THE WEST IN GOOD THINGS . . . WHY IN SUCH THINGS AS DANCING?"

Well he knows that example is contagious behavior. Well he knows that it is by imitation, far more than precept, that men can learn effectively and build on that knowledge.

Well he knows that his industrial men see, in the material coming from America, that recourse to ARC WELDING provides three basic GOOD THINGS for China's victory, for China's industrial effectiveness, for China's social advancement . . .

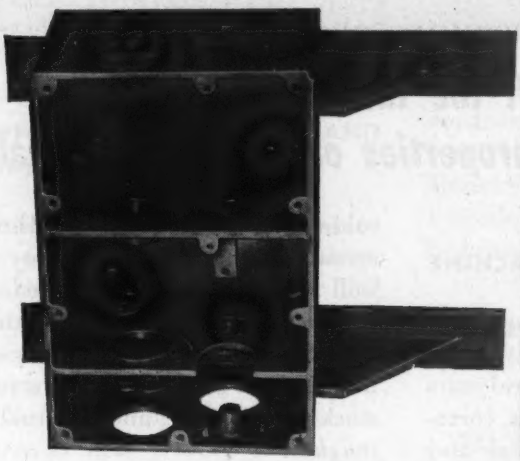
(a) faster production of more products

(b) more effective products

(c) for less money.

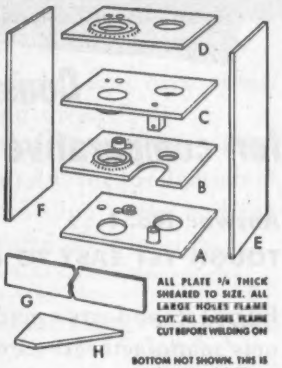
"Imitate in good things," he says

Here, Generalissimo, **is a GOOD THING to imitate . . . just one of thousands of designs that have been converted to welded steel to get** ***better performance and lower cost:***



A GOOD THING IN TRANSMISSION CASES

Changeover of this transmission case of a trenching machine to welded steel construction cut total cost from $25.80 to $14.85 or 42.5% and trimmed weight from 215 lbs. to 180 lbs. Discussion of the conversion of this and other parts of the trencher is given in Machine Design Sheets now being distributed. Free on request to engineers, designers and production supervisors.



ALL PLATE 3/8 THICK SHEARED TO SIZE. ALL LARGE HOLES FLAME CUT. ALL BOSSES FLAME CUT BEFORE WELDING ON

BOTTOM NOT SHOWN. THIS IS A 14 1/8 x 21 7/8 x 3/8 PLATE

HOW IT IS BUILT

Pieces made of plate were sheared to size and all holes flame-cut. Circular pieces for bosses were flame-cut; bar stock parts were sawed. Pieces A, B, C and D were jigged for the welding on of bosses and bars. The whole was then clamped and tack welded. Joints were made by lapping 3/16", using a full corner weld. The finish welding was done on a positioner. Brackets, made of pieces G and H, were welded last, the welding being alternated between brackets to give more uniform heat distribution and minimize distortion.

THE LINCOLN ELECTRIC COMPANY • Cleveland 1, Ohio

America's greatest natural **recourse**

ARC WELDING

QUESTION No. 1

Which INCO Nickel Alloy is FREE-MACHINING?

Consult the tables below for comparative properties of these two metals

Answer No. 1...

TOUGH YET EASY TO MACHINE

Engineers and screw machine products manufacturers already know this metal. Introduced several years ago, "R" Monel offers the corrosion resistance, toughness and strength of regular Monel, plus improved machining characteristics.

Readily fabricated by cold forming, "R" Monel is available as hot-rolled and cold-drawn rounds, squares and hexagons. This INCO Nickel Alloy is well suited for automatic production of rust proof screw machine parts, yet has mechanical properties at least equal to steel screw stock (SAE 1112), and is actually *tougher.*

PROPERTIES OF "R" MONEL

Condition	Tensile Strength 1000 psi	Yield Strength (0.2% offset) 1000 psi	Elongation in 2 in. per cent	Hardness BHN 10-mm. ball 3000 kg.
Cold-drawn, annealed	70- 85	25- 40	50-35	110-140
Cold-drawn, as-drawn	80-115	50-100	35-15	150-230
Hot-rolled, annealed	70- 85	25- 40	50-35	110-140
Hot-rolled, as rolled	75- 90	35- 60	45-25	130-170
PROPERTIES OF SAE 1112 STEEL SCREW STOCK				
Cold-drawn, as-drawn	80-100	70-80	20-10	170-202
Hot-rolled, as rolled	60- 80	35-55	40-30	126-150

QUESTION No. 2

Which is free-machining and also HARDENABLE *by* HEAT TREATMENT?

Answer No. 2...

OFFER EXTRA HARDNESS AND STRENGTH

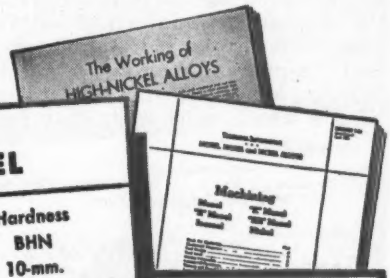
This metal is the latest addition to the family of INCO Nickel Alloys. Its name..."KR" Monel. Like "R" Monel, "KR" Monel combines corrision resistance and strength with improved machining.

But "KR" offers a big plus . . . *through heat treatment this unusual metal develops exceptional hardness and strength.*

A non-magnetic alloy, "KR" Monel is suitable for production of corrosion-resisting parts, and can be heat-treated after machining.

For complete information on these and other INCO *Nickel Alloys, write to:*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York, N. Y.



PROPERTIES OF "KR" MONEL

Condition	Tensile Strength 1000 psi	Yield Strength (0.2% offset) 1000 psi	Elongation in 2 in. per cent	Hardness BHN 10-mm. ball 3000 kg.
Cold-drawn, as-drawn ...	100-125	70-100	35-15	175-250
Cold-drawn, heat-treated.	140-170	100-130	30-15	260-320
Hot-rolled, as rolled.....	90-120	40- 85	45-30	140-225
Hot-rolled, heat-treated..	135-160	90-120	30-20	260-300

Machining Techniques for both "R" and "KR" Monel are clearly and fully described in Machining Bulletin T-12. Write for as many copies as you can use and also for the reprint "The Working of High Nickel Alloys."

Balancing Rotating Parts

A discussion of the methods, technique, and equipment employed in the balancing of rotating parts for smooth running at high speeds

By JOHN E. HYLER

THE increasing insistence, in recent years, upon industrial machinery that would be vibrationless, noiseless, and smoother in operation has focused attention upon one of the most obvious means of achieving these objectives—the proper balancing of rotating parts of the machines.

The principle of centrifugal motion and the grief that may develop from the unbalanced condition of rotating parts comprise an old story to engineers; a story that often is reflected in sales. A piece of equipment the design of which includes rotating parts that are not properly balanced will be subject not only to vibration and noise, but also to a shortened life, due to the unbalance. Further, users of such equipment in general are far more vibration-conscious than in past years, and many potential customers notice vibration resulting from unbalance immediately the equipment is put into operation, thus leading them to a negative decision at the outset.

The speed at which a rotating part is intended to revolve in service has a direct bearing upon the degree of nicety required in balance, for centrifugal force varies not as the speed, but as the square of the speed. Unbalance, and the damage it works, increases in like proportion. There is no point in taking extreme care in the balancing of a part that revolves very slowly, although, unquestionably, some attention must be given to it.

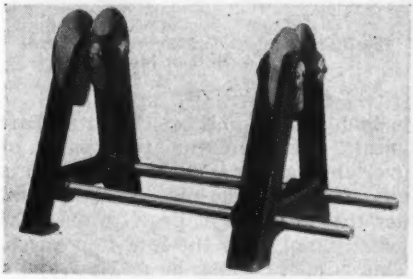
There was a day when all the balancing that was done was so-called static balancing, and there are still many cases and places where static balancing (the true balancing of a part while not in motion) is adequate. Also, there are cases where static balancing is helpful as a preliminary operation, the intention being that a

"Pillow-Block" Type of Balancing Way with Over-Lapping Discs



more adequate balance shall be obtained later. Fortunately, a sufficient variety of balancing machines and devices are available so that it is now unnecessary to turn to the antiquated makeshifts that formerly were rigged up by the shop handyman.

The simplest form of thoroughly efficient static balancing device consists of four discs, mounted in pairs with each pair overlapped in such



One of the Frames of this Balancing Way, Made by Anderson Brothers Company, Rockford, Ill., is Fixed while the Other is Adjustable

manner, and so aligned, that a shaft laid across the edges of the discs will nest and at the same time will be properly supported. Such devices, made by different manufacturers, vary somewhat in their adaptations, although the disc portion of the design is basic.

One such balancing "way" is made in pillow block form, so-called, each unit consisting of a base plate supporting two parallel sections carrying ball bearings which, in turn, support the spindles of the overlapping discs previously mentioned. This equipment is made by Anderson Brothers Manufacturing Company, Rockford, Ill. Two such pillow block-type balancing units may be mounted on a bench for balancing parts of small diameter, or they may be fitted to a sub-base to handle work of larger diameter.

When a part that is to be balanced



In War, as in Peace . . .

CERRO ALLOYS

Save time and cut costs!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

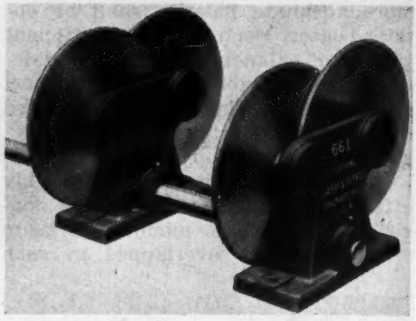
CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc., and many similar applications.

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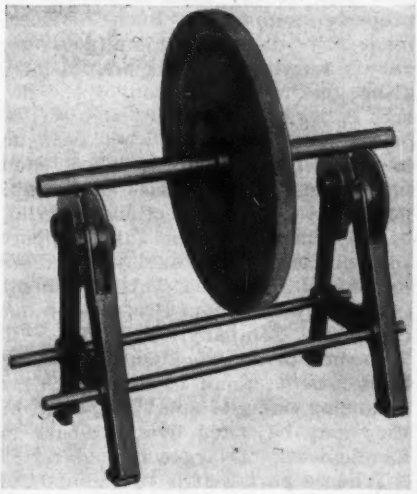
40 WALL ST. NEW YORK 5, N. Y.



The Discs of this Balancing Way are made Integral with their Journals

is laid on the unit so that its shaft "nests" between the two pairs of overlapping discs, if the workpiece is out of balance the piece revolves, under the influence of gravity, until the heavy point is in the lowest position. This point can then be marked and a bit of metal removed to equalize the balance. When the piece will remain without motion in any position to

Balancing Ways of the Type shown Here, made by Ideal Commutator Dresser Company, are Available for Work up to 60-Inch Swing



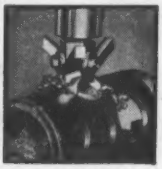


The right Tool helps

Here's the CLARK ADJUSTABLE HOLE CUTTER... the *one* right tool to replace *many* fixed radius cutters... four Clark Cutters are ADJUSTABLE TO COVER CUTTING RANGE OF 5/8" to 5"... from thin sheets to 1" thick stock... for use in drill presses, electric drills, milling machines and lathes... take punishment and give finished cuts the first time in steel, pipe, hard fibre, plastics, Masonite, wood and other materials.



Simple to adjust, yet the Clark Hole Cutter performs more efficiently than a fixed radius cutter of that diameter.



Clark Hole Cutter making vari-sized holes in extra-heavy steel pipe. No burring necessary.

Order today from your jobber or write for Bulletin No. MMS-5.



In Canada:
DOMINION BEARINGS, LTD.,
Toronto, Montreal, Winnipeg.
Export: THE AMERICAN STEEL EXPORT COMPANY, INC.,
New York, Los Angeles.

Robert H. Clark Company
9330 SANTA MONICA BOULEVARD • BEVERLY HILLS, CALIFORNIA



Balancing Machine Designed for Workpieces with short Axes

which it may be revolved, it is in static balance.

The same firm which supplies the pillow block units also makes a set of balancing ways with each pair of overlapping discs supported in an A-frame. The two A-frames which make up the set are connected by means of shafts which keep them parallel, one frame being rigidly mounted on the shafts and the other slidably mounted so that they can be adjusted for distance according to the length of the workpiece.

Similar balancing ways in sizes from 10-inch to 60-inch swing are made by Ideal Commutator Dresser Company, Sycamore, Illinois. This firm makes its discs of semi-steel with a nickel content. Ball bearings

High Quality *Quick Delivery*

SMALL PINS

VOLUME PRODUCTION BY OUR SPECIAL NEW TYPE EQUIPMENT

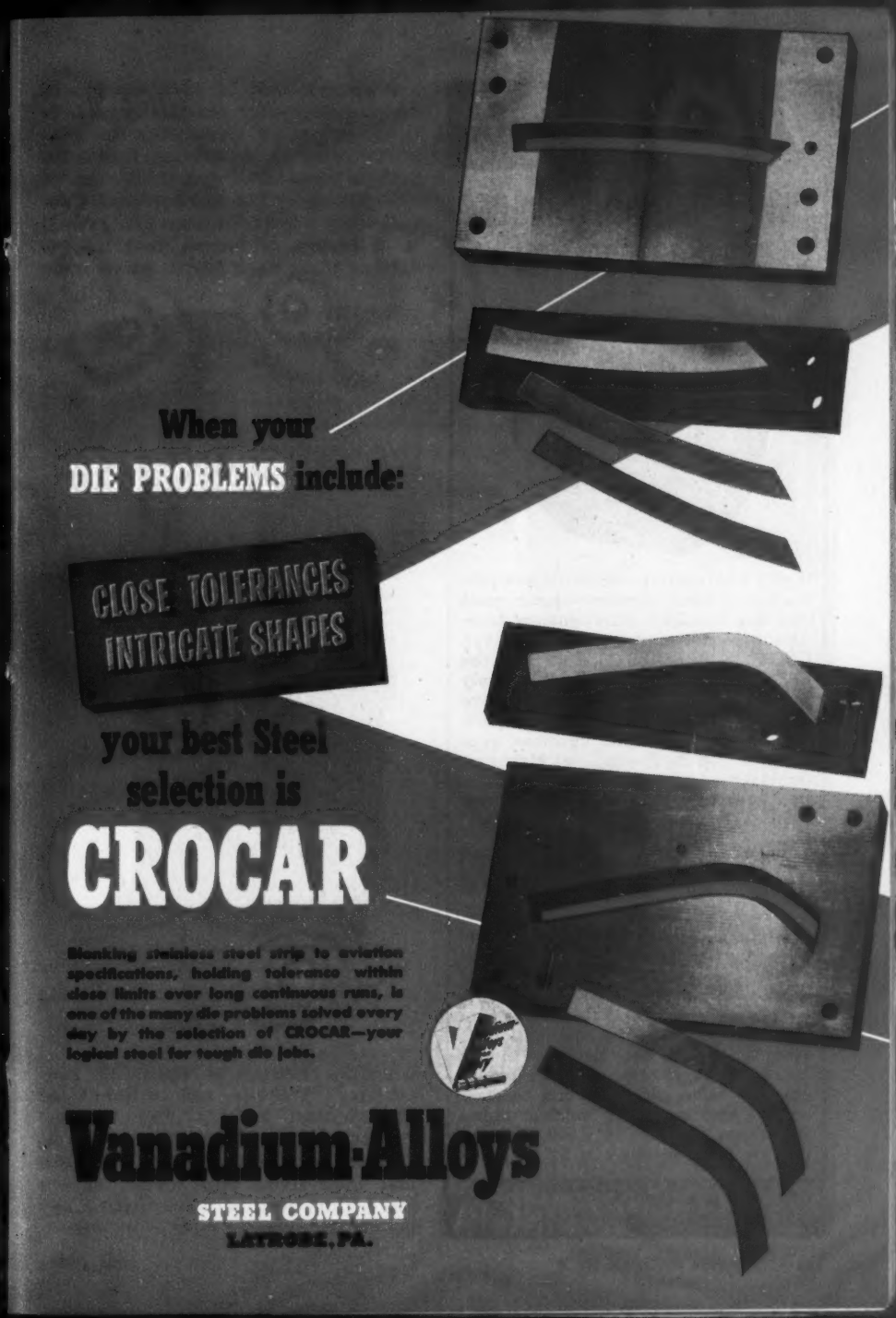
.030" to .125" Diam.

.125" to 2" Length

SMOOTH ENDS — CLOSE LENGTH TOLERANCES — CONCENTRIC CHAMFERED OR FORMED ENDS — HARDENED AND GROUND, WHERE REQUIRED, TO ± .0001 DIAM. TOLERANCE.

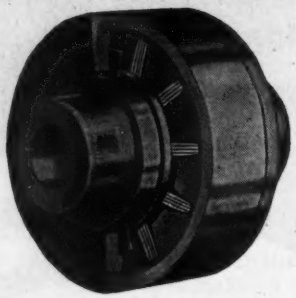
COMMERCIAL CENTERLESS GRINDING CO.

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When your
DIE PROBLEMS include:
CLOSE TOLERANCES
INTRICATE SHAPES
your best Steel
selection is
CROCAR
Blanking stainless steel strip to aviation specifications, holding tolerance within close limits over long continuous runs, is one of the many die problems solved every day by the selection of CROCAR—your logical steel for tough die jobs.
Vanadium-Alloys
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LOOK - - -

WHAT CUSHION TORQUE WILL DO FOR YOU



If you want steady, uninterrupted production — lower machine-repair costs and freedom from misalignment troubles, take advantage of the long-lived CUSHION TORQUE developed by the KANTI-LEVER COUPLING. It not only protects you against misalignment like the ordinary coupling, but it goes several steps further and cushions your Motors and Productive Machines against the wear, vibration and fatigue that are the source of most machine failures. No other coupling is like the—

Kanti-Lever Coupling

It has a circular series of laminated, resilient Cantilevers of 200,000 lb. steel operating in taper-side slots. End thrust is impossible: leverage on the cantilevers decreases automatically with increased load: safety stops prevent damage from extreme overloads: special end-float obtainable up to four inches without increase in cantilever stresses: outer periphery can be used as a brake drum for quick-stopping machinery. Over 3,000,000 H.P. in service. *Send for Bulletin No. 28-M.*

BROWN ENGINEERING CO. 120 N. THIRD ST. READING, PA.

are always used in such equipment because they offer practically no frictional resistance. Such units are generally used in balancing flywheels, pulleys, armatures, and similar parts.

In fitting up the discs or plates for balancing ways of this general type it is necessary, of course, that the revolving plate itself and the axis upon



This Machine includes a Drill for Removing the Stock necessary to restore the Workpiece to Balance

which it revolves be absolutely concentric. This is not difficult of achievement, but the Fay & Egan Company, Cincinnati, Ohio, ensures such concentricity by having the discs and their axial pins turned in one piece, thus positively eliminating any possibility of error.

Distinctive!

MO-MAX

The grinding sparks of MO-MAX are distinctive... so is its performance.

The distinctive performance of MO-MAX High Speed Tool Steel has established its superiority in production tools for the most severe service. MO-MAX makes tools that are harder and tougher — have superior cutting quality. The steel is easy to machine, grind and weld. It saves 8% in the weight required to make a tool.



- The color of the sparks is orange.
- Most of the sparks end in a spear head, usually curved.
- Very few branches or stars appear on the spark lines.

By its sparks, MO-MAX Molybdenum Tungsten High Speed Steel may be distinguished from:

Machinery Steel	by the orange color, fewer branches and sparks.
Carbon Steel	by the orange color and spear heads instead of stars.
18% Tungsten Steels .	by the orange color, the spear heads and more sparks.

These distinctive sparks make it possible to identify the steel when labels are lost, to check up on tools of unknown composition, to sort mixed scrap.



Leading steel companies in North America and Europe are licensed to make MO-MAX. A booklet is available giving the latest data on Molybdenum Tungsten High Speed Steels and microscopic comparisons with 18-4-1 under different heat treatments. Write for your copy to The Cleveland Twist Drill Co., Cleveland, Ohio.

FOR QUALITY AND QUANTITY PRODUCTION... SHIFT TO... MO-MAX HIGH SPEED STEEL

*MO-MAX is a proprietary name owned and controlled by The Cleveland Twist Drill Company and its only licensed use by others is on steel made and sold by licensees under U. S. Patent Nos. 1,937,334; 1,998,953; 1,998,954; 1,998,955; 1,998,956; 1,998,957; and Canadian Patent Nos. 346,506; 364,032 and 364,033.

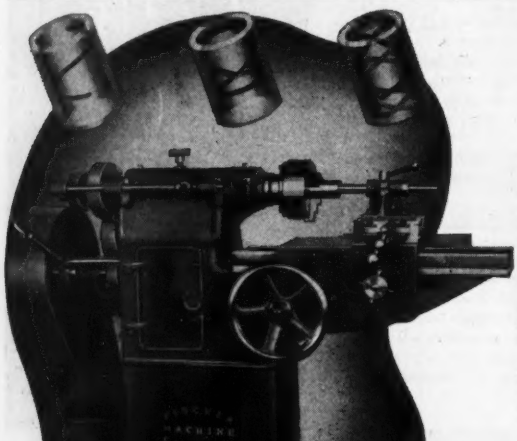
Balancing to ⅛ ounce-inch is easily possible on such equipment. This is much closer than is required for most parts, but it is indicative of the accuracy with which these tools are made.

Balancing Parts of Short Axis

A workpiece that has a short axis is not as readily balanced on equipment of the type described above as on other types of balancers. One machine, in particular, has been especially designed for balancing parts with short axes. This machine, made by Commerce Pattern Foundry & Machine Company, Detroit, Michigan, not only locates the angular position of the unbalance and detects the amount of unbalance, but also provides a drill spindle and power to make the necessary correction while the work is in the machine. With the "heavy" point located, enough metal is drilled out to compensate for the overweight.

The workpiece is mounted on a vertical stud for balancing. The machine is equipped with a universal spirit level which instantly indicates the angular location of the point of unbalance, and also provides a special weighing mechanism that shows the amount of metal of a given diameter that must be removed in order to balance the part. With this machine workpieces can be balanced to within ¼ ounce-inch, and it may be set in any location in the factory, for it is unaffected by vibration.

Another and somewhat similar static balancing machine is marketed by The Taylor Sales Company, Milwaukee, Wisconsin. The machine is made in a variety of sizes, the complete line having a range that will accommodate workpieces from 2 inches to 90 inches in diameter, weighing from 5 ounces to 3,000 pounds.



FISCHER

Oil Groovers

A wide variety of grooves may be cut on the "FISCHER" . . . with minimum set-up time and cost.

Bearing in which groove is to be cut is mounted on revolving chuck secured on work spindle. Boring tool is secured to carriage slide which has a reciprocating motion timed with work spindle and lined by crank gear and connecting rod.

Several attachments can be furnished for cutting practically any type of oil groove.

Capacity of No. 1 Machine — 5" dia. . . . No. 2 Machine—15" dia.

PROMPT DELIVERIES

Write for catalog.

FISCHER MACHINE CO.

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This book gives you Complete Air Cylinder Information

Hannifin Bulletin 57 gives you all the dimensions, all the data for quick, easy selection of the right pneumatic cylinder for any application. Hannifin precision cylinders are available in seven standard mounting types; sizes 1 to 12 inch bore with cup type piston, sizes 3 to 12 inch bore with adjustable "Leak-proof" type piston; for any length stroke. Large sizes can be built to order. Single and double acting types can be furnished with or without cushion at either or both ends. All types have Hannifin precision construction, with bored and honed cylinder bodies, and superior piston fit for maximum power utilization. Bulletin 57 will help you get the most out of air power. Write for your copy.

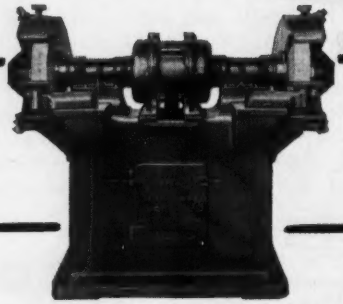


Honed bore of a 46 in. x 7 ft. cylinder

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HANNIFIN *pneumatic* **CYLINDERS**

FOR
FOUNDRY
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BRIDGEPORT Floor Grinders

The rugged strength, durability and power of these grinders make them particularly well adapted for foundry snagging.

BRIDGEPORT Floor Grinders will withstand all kinds of service, hard work and abuse—day in and day out.

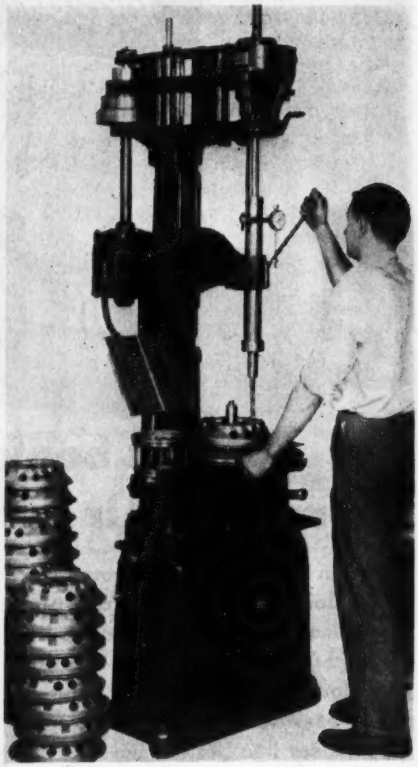
Put your hard, continuous offhand grinding jobs on a BRIDGEPORT.

Write for catalog.

Also Resinoid, Vitrified and Silicate Bonded Grinding Wheels, Face Grinders, Knife Grinders, Tool Grinders, Abrasaw Cut-off Machine.

BRIDGEPORT
Safety Emery Wheel Co., Inc.
1297 W. BROAD ST. BRIDGEPORT, CONN.

The operating principle of this machine is practically as simple as that of a plumb line, in which a suspended weight comes naturally to rest. Where this is done, the heaviest point will naturally be lowest. The machine is designed with a stem arising from



An aluminum Beam transmits the Unbalance to a Universal Spirit Level which indicates both the Position and Amount of the Unbalance

the center of the machine housing, upon which the workpiece is mounted. Any unbalance is transmitted by an aluminum beam to a universal spirit level, which in turn indicates both the position and the amount of the unbalance. The machine, equipped with



You get more than a fine tap WHEN YOU SPECIFY "GREENFIELD"

THE phone rings. "We're having trouble with our tapping operation. Can you send a man?"

"Greenfield" can . . . and does. Because "Greenfield" feels its responsibility is not only to produce fine threading tools, but also to help customers get the most out of them through proper selection and use. Its responsibility ends only when its customers are getting top threading performance. That is one reason why you get more than a fine tap when you specify "Greenfield."

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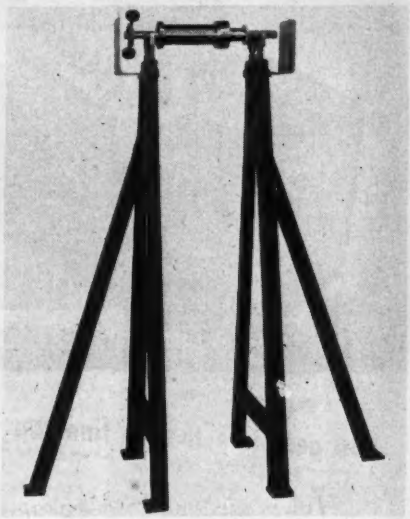
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its own drill spindle, is highly efficient, and is widely used.

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Various methods have been used in the balancing of airplane propellers. One type of device is designed to combine two level ways on which an arbor of special type may roll, the propeller being mounted on the arbor and the ways located at sufficient height to provide ample clearance for the propeller to revolve without touching the floor.



Airplane Propeller Balancing Machine designed with two Ways to Support the Workpiece

The ways, entirely separate from each other, are mounted on the top of a three-legged stand, ensuring that there will be no "teetering" of the ways. The ways are mounted in parallel alignment, and far enough apart to accommodate the work arbor. Adjusting nuts are provided by means of which the ways may be leveled. To balance the propeller, balance weights are provided at one end of the arbor.

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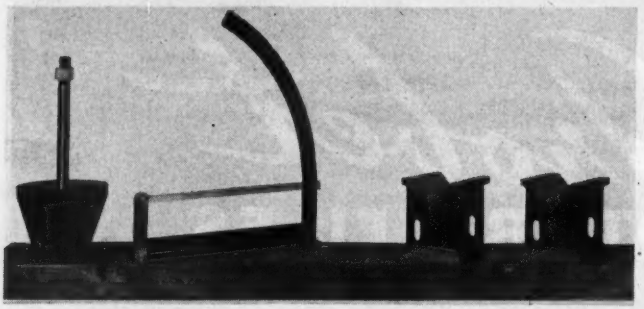


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Special Arbor for balancing Airplane Propeller, having Weights at one End with Which the Unbalance can be Determined and Corrected

The weights can be moved to any angular position and can also be adjusted radially to compensate for any unbalance in the propeller until the combined assembly is brought to perfect balance. Being graduated in inch-pounds, the weights will show directly the amount of material that must be removed from the propeller to bring it into proper balance.

To meet the need for balancing scales that will serve war production purposes, several scale manufacturers have redesigned their products to meet such needs. As an example: the Toledo Scale Company, Toledo, Ohio, has developed a propeller-blade balancing scale with which airplane engine propeller blades can be balanced, both longitudinally and transversely, with extreme accuracy and sensitivity. Not only are new blades balanced on such equipment, but worn blades are rebalanced. Again, the device may be used to aid in duplicating blades of an old design.

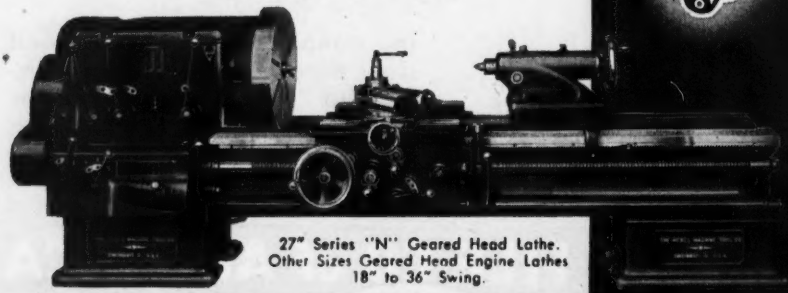
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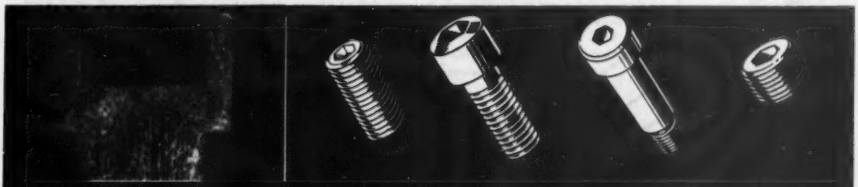
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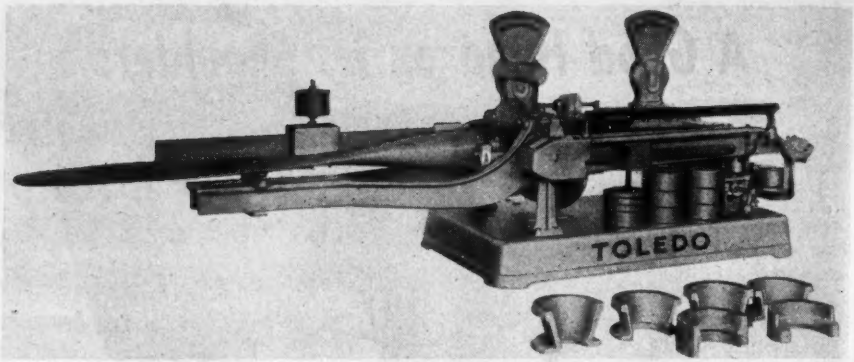
Starting when the wire stock enters the P-K plant, and ending only when the finished screws are packed, the P-K Quality-Control Laboratory checks every mechanical and physical characteristic of P-K Cold-forged Socket Screws. Tests and inspections cover Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Thread Fit.

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Balancing Scale with Which a Propeller Blade can be Balanced both Longitudinally and Transversely. Product of Toledo Scale Company

Dynamic Balancing Equipment

The balance obtained by the use of the static balancing equipment previously described is sufficient for many types of products, but there are countless cases where high speeds are involved for which static balancing is inadequate. Included among these are the rotors for steam turbines, crankshafts for internal combustion motors, rotors for electric motors, and so on.

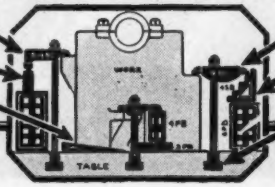
Very small differences that will not show up at relatively slow speeds are magnified tremendously in the high

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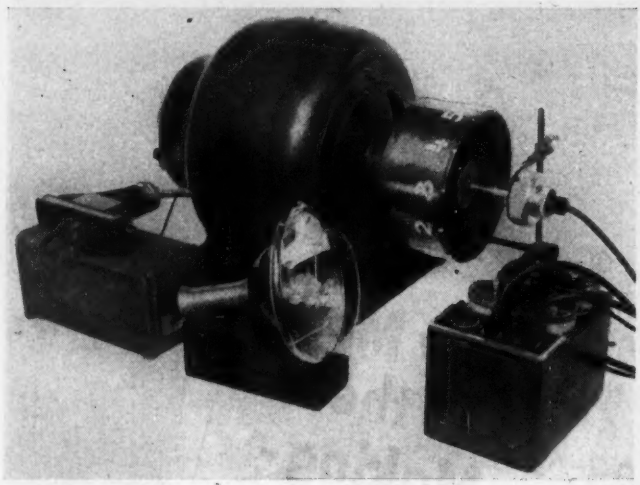




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This Portable Balancing Machine can be Taken to the Work, where Necessary

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Dynamic balancing machines are made in various designs. One type—and one which has steadily increased in importance—is the portable balancing unit which, because of its por-

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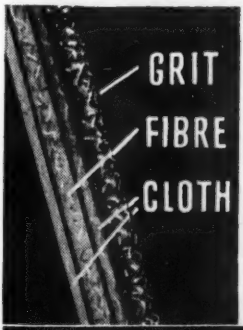
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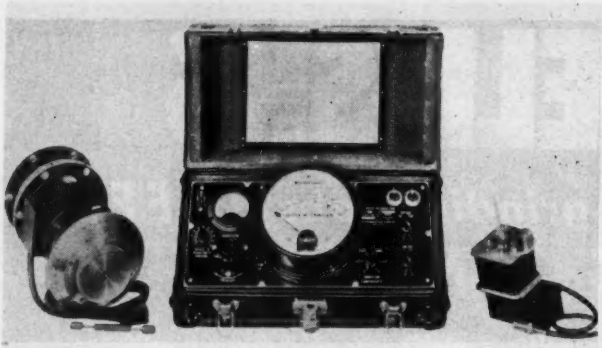
3rd layer – heavy drill cloth front and back of fibre. Prevents fibre from cracking when bent during grinding.

All grits from 320 to 16. Write for free trial samples!

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The Portable Dynamic Balancing Machine shown Here, Product of Gisholt Machine Company, can be used to Detect Unbalance in Rotating Parts without Necessity of removing the Parts from the Machines in Which They are Used. This Machine was Developed by Westinghouse Laboratories

tability, can be used in the field as well as in the shop. There are those who specialize in such equipment, such as Vibroscope, Incorporated, New York City. Some of these firms also make vibrometers which may be used simply to take readings or measurements of machine vibrations. Vibrometers are good inspection instruments where it is necessary to hold vibration within certain prescribed limits, or to sidetrack a machine or part for further examination and adjustment.

One manufacturer of a fine line of stationary dynamic balancing machines — Gisholt Machine Company, Madison, Wisconsin—has included in its line a portable dynamic balancing machine that was primarily designed by the research laboratory of a large manufacturer of electrical equipment.

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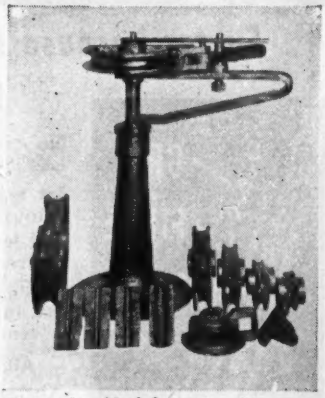
Bureau of Ships, Wash., D. C.; Henry J. Kaiser Co., Calif.; Pacific Bridge Co.; Bethlehem-Hingham Shipyards; Hercules Powder Co.; Stone & Webster Engineering Corp.; E. I. Du Pont de Nemours & Co.; Louisiana Shipyards; Westinghouse Elec. & Mfg. Co.; General Motors Corp.; Carnegie-Illinois Steel Corp.; Henry Ford Company.

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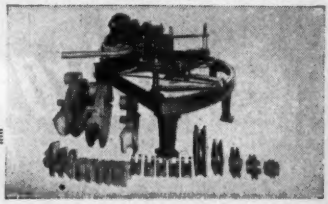
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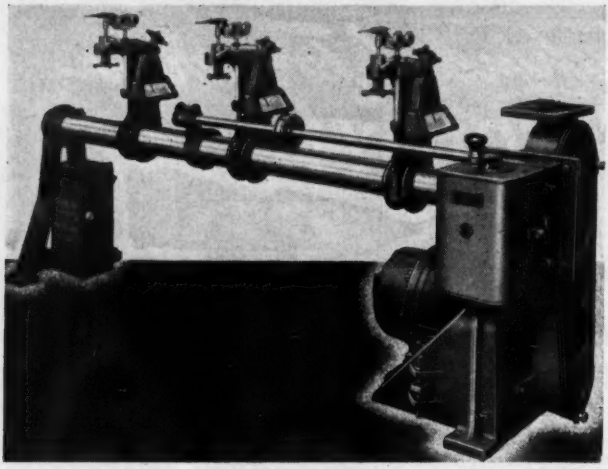
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This unit can readily be transferred from place to place by one man, the whole outfit being contained in two cases that are convenient to handle. The unit can be used to detect unbalance in large rotating parts of special design without disassembling such parts from the machines. Parts which rotate at speeds of from 100 to 10,000 r.p.m. can be checked by this means, both the angle and amount of unbalance being detectable. With readings obtained from the unit, weights may be applied to correct the unbalance.

One manufacturer of machinery which requires careful dynamic balancing developed a highly practical



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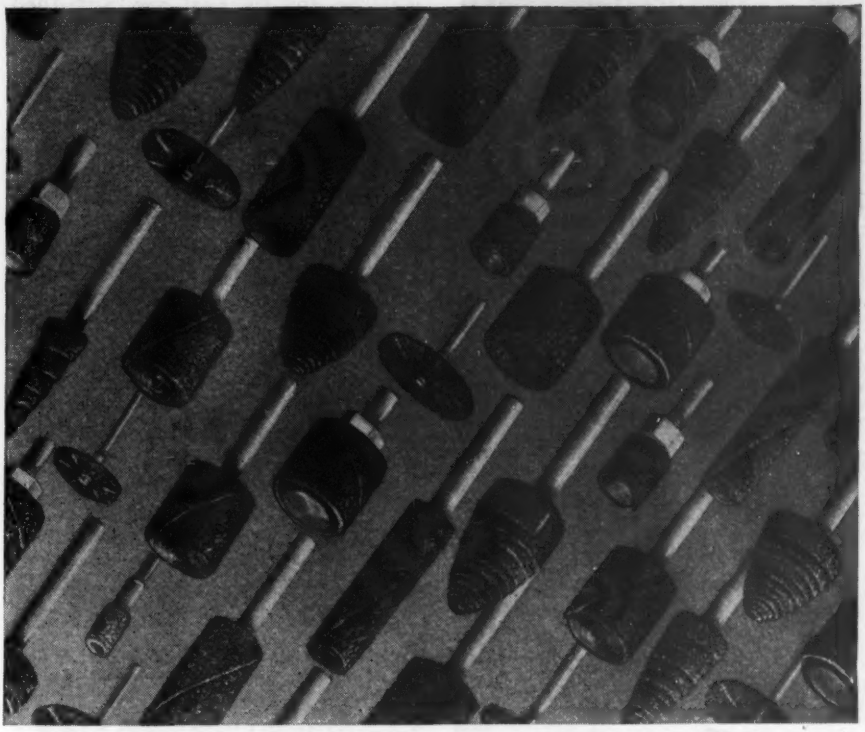
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At speeds up to 20,000 r.p.m., isn't it obvious that they will do in seconds what now takes minutes by old-fashioned methods?

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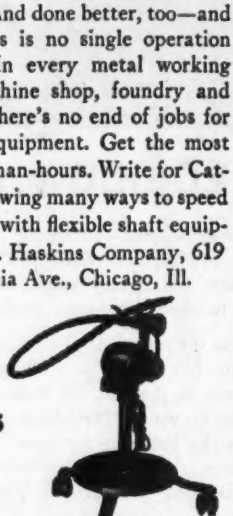
But, from the hundreds of sizes, shapes and grits, don't try to pick the one you think will do the job. We'll do better than that for you. A Field Engineer will tell you the best one for each specific operation and demonstrate on the toughest jobs you dig up for him. Simply call our nearest branch.

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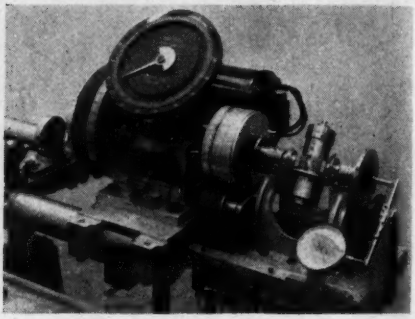
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haskins
FLEXIBLE SHAFT EQUIPMENT

machine for its own use, and then placed the balancing machines on the market along with its other product. This firm is the Norton Company, Worcester, Massachusetts, which manufactures both cylindrical grinding machines and a large and complete line of abrasive wheels and other abrasive products.

The parts for which the balancing machines were designed are held in supports that weigh only 1½ pounds each, the object of the light weight of the supports being to minimize the inertia of the supports and thus aid in the detection of small centrifugal forces.



Tinius Olsen Balancing Machine Designed for both Static and Dynamic Balancing

Combined Static and Dynamic Balancing

Since both static and dynamic balancing are important factors in production, it is not surprising that some manufacturers who specialize in the manufacture of balancing equipment should provide both types of equipment—and even to combine facilities for both types of balancing in the same machine. Among these is the Tinius Olsen Testing Machine Company, Philadelphia, Pennsylvania, which makes various types and sizes of balancing machines for static and dynamic balancing of fans, pulleys,

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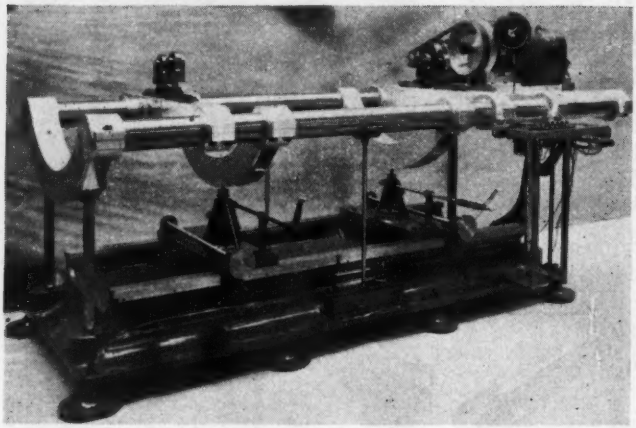
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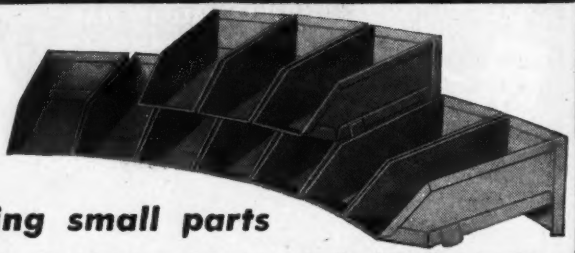


In this Machine, Designed by Tinius Olsen, the Angular Position of the Point of Unbalance is Indicated by an Electric Spark

crankshafts, cylinders, tubing, clutches, turbine rotors, and so on. Some of the machines made by this company for balancing motor rotors are so designed that it is possible to completely balance the rotor dynamically without reversing the part, end for end, or even stopping the balancing machine.

Another machine made by this firm is intended for balancing long crankshafts or other parts for which more than two supports are required for proper balancing. After an unbalanced crankshaft has been placed on the rolls of the vibrating frame of this machine, it is connected to the drive head of the machine through a flexible coupling and the vibrating

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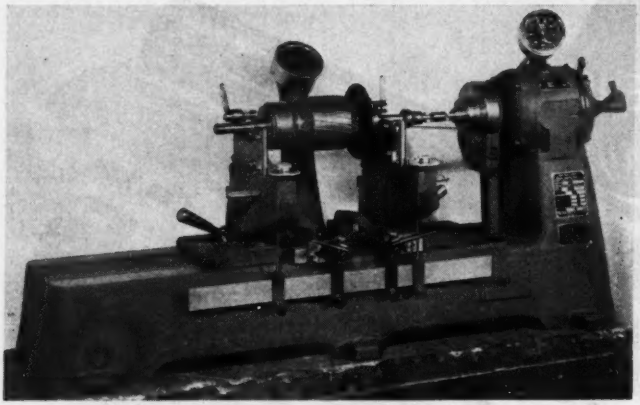
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The Application of the Neon Light in the Design of this Balancing Machine, Product of Globe Tool and Engineering Company, makes it possible to Locate the Point of Unbalance in Small, High Speed Rotating Parts. The Unbalance in one Plane can be "Locked Out" while the Point of Unbalance in the other Plane is being Discovered

frame is locked about a pivot at the left-hand end so that a reading for correction at the right-hand end only may be taken.

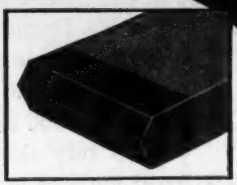
As the crankshaft revolves, an indicator which traverses a dial in view of the operator is caused to revolve at an equal angular speed. Any unbalance in the right-hand end will cause an electric spark to jump from the indicator to the graduated metal circle on the dial. By taking note of the degree-graduations on the dial between which such electric sparks occur, the angular unbalance location may be determined. A special weight-

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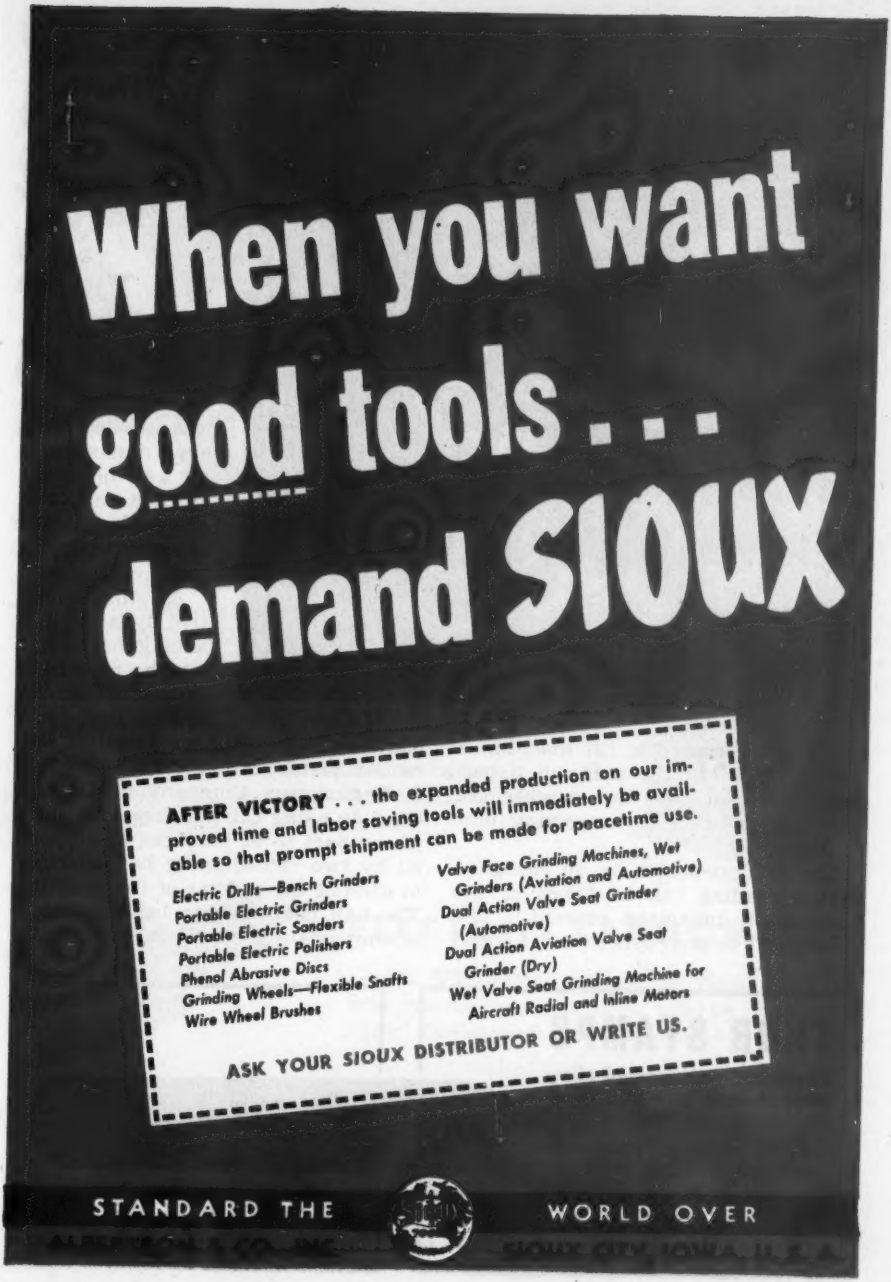
Carboloy-tipped scrapers speed up your scraping operations—eliminate all tendency to scratch or dig in—and last at least 10 times longer than steel scrapers. Only a few seconds required for resharpening, using a diamond wheel. No hand stoning required. In recent independent tests at a leading research institute, covering all materials scrapeable, Carboloy-tipped scrapers averaged 75 sq. in. per sharpening as against 6½ sq. in. with steel scrapers.

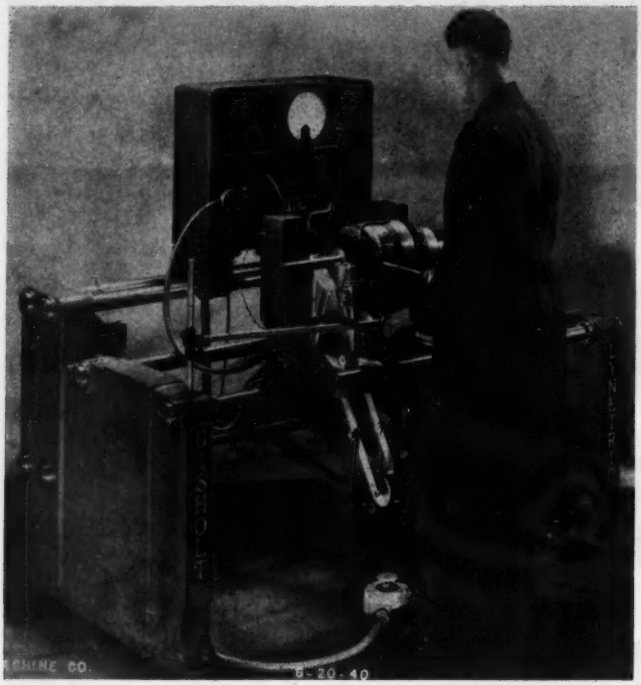
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Dynamic Balancing Machine made by Gisholt Machine Company in which the Radio Principle of Amplification is Employed, making it possible to Locate and Measure Unbalance Vibration of only 25 Millionths of an Inch

holder incorporated in the machine is then swung into the plane of unbalance indicated, and the weights are adjusted to bring the revolving unit to balance.

The weight-holder is so designed that a reading can be taken of the amount of unbalance present. The crankshaft is then turned end for end and the process is repeated. With the amount and location of unbalance dynamically determined at each end, it is a simple matter to make the necessary corrections.

A super-sensitive dynamic balancing machine in which a neon light is used to discover and indicate the planes of unbalance, or so-called correction planes, is made by Globe Tool & Engineering Company of Dayton, Ohio. In using this machine, the shaft of the part to be balanced is supported by two self-aligning ball bearings in each of the saddles of the machine. The ball bearings can be adjusted to accommodate a considerable range of

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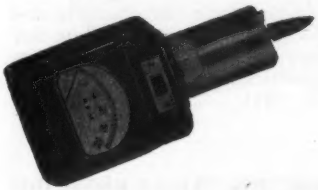
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sizes of shafts.

One of the most valuable features of this machine consists in that provision has been made to "lock out" the unbalance in one correction plane while obtaining a true reading on the unbalance in the other. The amount of correction required in each of the correction planes is read from dials which are sensitive to 0.2 ounce-inch of unbalance. The machine is made in a range of sizes that will handle work of practically any size and weight.

A very clever and useful stratagem that is being employed effectively in the field of dynamic balancing is the use of amplification, by which the unbalance is deliberately multiplied for measurement. The Gisholt Machine Company has gone deeply into this phase of balancing technique, and has applied it in the design of its machines. The radio principle of amplification is used, the result being that vibrations having a magnitude of only 25 millionths of an inch can be located and measured with this equipment.

As the application of the balancing technique widens and increases, noise, vibration, and undue wear in the operation of high speed machinery will diminish.

. . . Domestic production, imports and stockpiles of tungsten are more than sufficient; therefore, premium price payments to producers will be discontinued on April 30, 1944.

"American" Hole Wizard Radial Drill is the subject of a 24-page profusely illustrated bulletin released by The American Tool Works Co., Cincinnati 2, Ohio. The various features comprising this unit, which has a 11-inch column, 12 spindle speeds, and 5 h.p. driving motor and is available in 3, 4, 5, and 6-foot arm sizes, are covered in detail and specifications listed. Copy of Bulletin No. 315 free to executives upon request.

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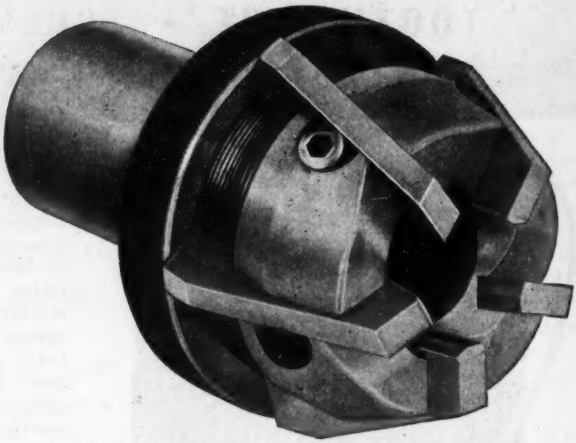
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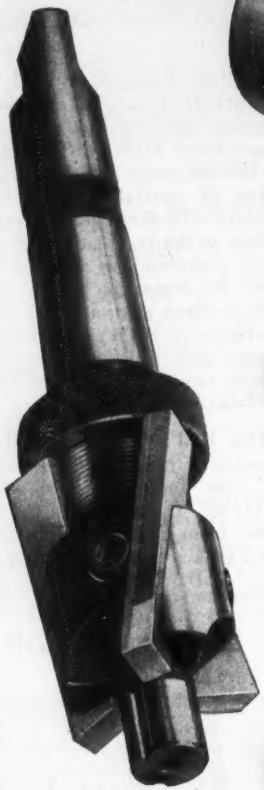
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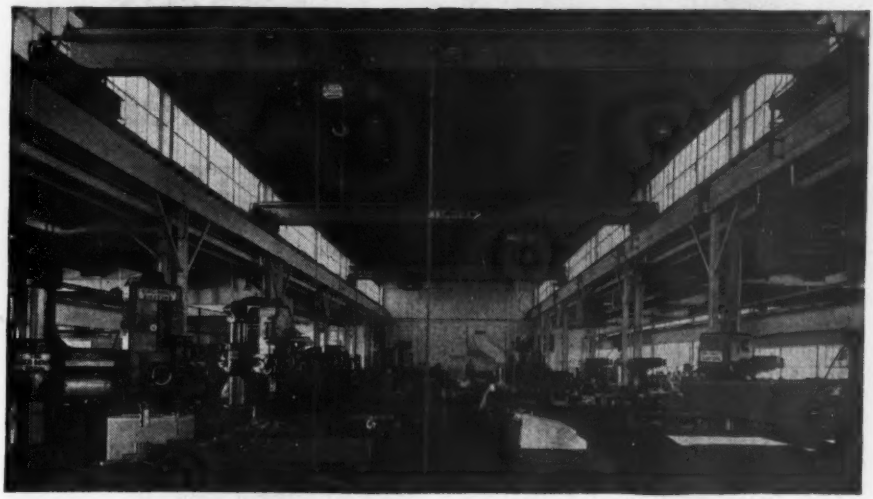
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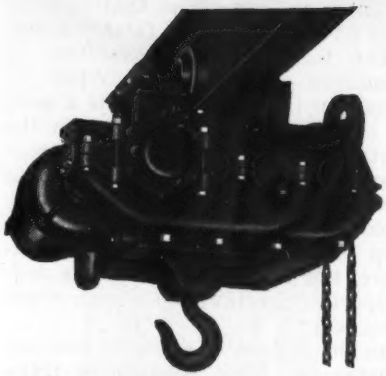
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Mexican Trade Trainees Earn While They Learn



Mario Ordaz, age 25, from the State of Sonora, Mexico, now receiving training in the United States as a selectee in the Inter-American Trade Scholarship program

IN ORDER to advance the nation-wide industrialization of Mexico, which President Manuel Avila Camacho has underscored as his No. 2 objective (his No. 1 objective is to help win the war), many promising young Mexicans are to receive technical training in the mills and factories of the United States as a part of the Inter-American Trade Scholarship program.

The Inter-American Trade Scholarship program was initiated by the office of Inter-American affairs as a practical expression of the Good Neighbor Policy and as a means of advancing industrialization in Mexico and in the other American Republics. Already scholarship awards for factory and technical training have been made to 22 young Mexicans, who are now working and learning in United States factories, offices and laboratories.

Trainees are now coming to the United States from all the 20 American Republics, but the largest group is from Mexico because transportation facilities make it easier for groups of 12 to 15 to come from that country than from the republics farther south.

The term "trade scholarship" is something of a misnomer. What the young men actually receive is a period of apprenticeship training in the particular trades or careers in which they are interested. The precept of "learning to do by doing" is the principle upon which the trade scholarship program is founded. Furthermore, the young men are made self-supporting in that they earn while they learn.

In the process of selecting the candidates for trade scholarship training, the young men are first recommended by a Trainee Selection Committee, one of which has been set up in each of the 20 capitols of the other American Republics. The committee, consisting of three, includes one American businessman who acts as chair-



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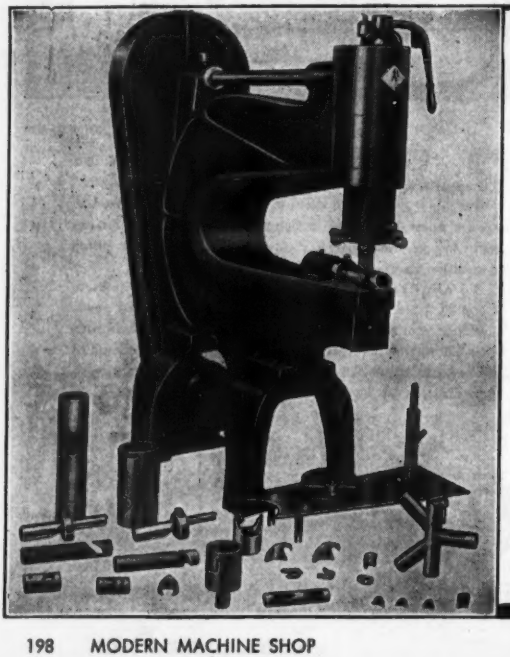
man and represents the interests of United States commerce and industry, an outstanding citizen of the nation represented who is also a member of the Inter-American Development Commission, and a represenative of the technical institutions of that nation. Selection of the candidates is on the basis of merit.

The applicant must be between 18 and 28 years of age, be able to pass a physical examination, and have a good working knowledge of the English language. Preference is given to those who have had technical, engineering, scientific, economic, commercial or agricultural education or a background of manifest aptitude in one of these fields.

The applicant is made to understand that the training will be of a strictly practical nature with much manual labor in actual operations on an equal basis with young Americans engaged in the same work. Those receiving scholarships are brought to the United States without cost to themselves. They are given an orientation course of training in Washington before going to work.

At the conclusion of his course, the young man is placed with some United States concern for a period of from one to two years, where he receives compensation while working and learning. His progress is closely supervised by the Inter-American Training Administration.

At the end of the training period, the young man is returned to his country. His traveling expenses are paid, as well as the cost of his stay in Washington during his orientation course. During his industrial training period, however, he is expected to live on the compensation he receives from the firm by which he is employed. Before departing for his home, he receives a certificate indicating the range of his accomplishments in the



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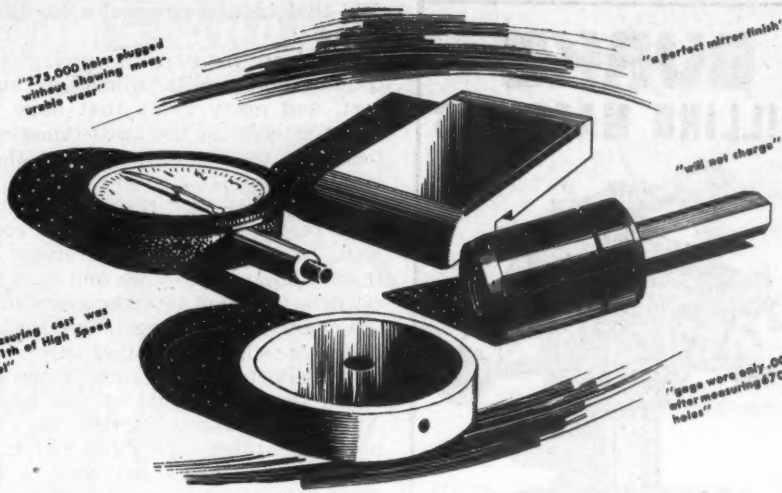
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field that he has chosen for his life's work.

American industry is giving the training program its enthusiastic support, and many firms that have no direct interest in the Latin-American field are taking trainees into their organizations.

Thus far all the trainees selected have been conspicuous for one common, outstanding characteristic — their willingness to work and an earnest determination to make every minute of the training count. One episode indicates what the other Americas think about the training program. When the newspapers of one Latin-American country carried the announcement that some young men from that republic would be sent to the United States for technical training, a line of young men applicants was formed before the office of the selection committee chairman before daylight next morning.

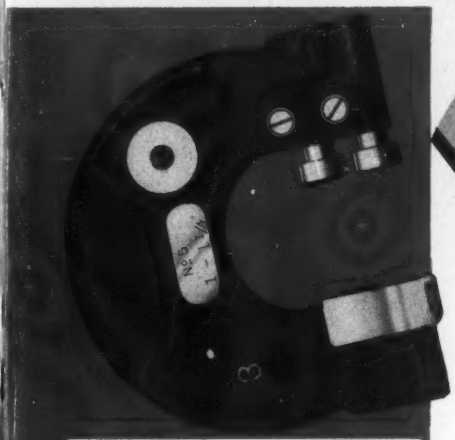
Summer Management Course at University of Iowa

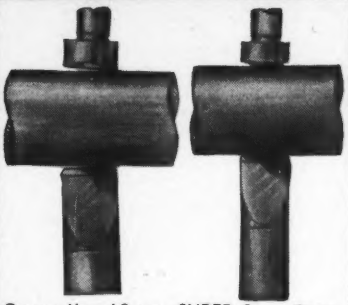
The University of Iowa is again offering a three-week management course to be held at the State University of Iowa, College of Engineering, Iowa City, Iowa, from June 12 to June 30, 1944. This course is designed primarily for industrial executives who want comprehensive training in production planning, plant layout, motion and time study, wage incentives, and related subjects. In this course fundamental training is combined with practical applications.

The course will be held under the direction of Ralph M. Barnes, Professor of Industrial Engineering at the University of Iowa. Professor Barnes will be assisted by a number of top-fight industrial engineers and other outstanding leaders in the field of industrial and management engineering. Courses will be held from 8 a. m. to 4 p. m. each day with forenoons devoted to lectures and discussions and the afternoons to laboratory and project work. Registration and communications concerning this course should be sent to Prof. Ralph M. Barnes at the above address.

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Conventional Snap Gage with flat surfaced gaging pins. Tilt is exaggerated purposely. Note that only at their edges do gaging surfaces contact work piece.

SUPER Snap Gage with the pin shank at the same angle as in the diagram at the left. Note that the contact conditions are exactly the same as if the pin were not tilted.



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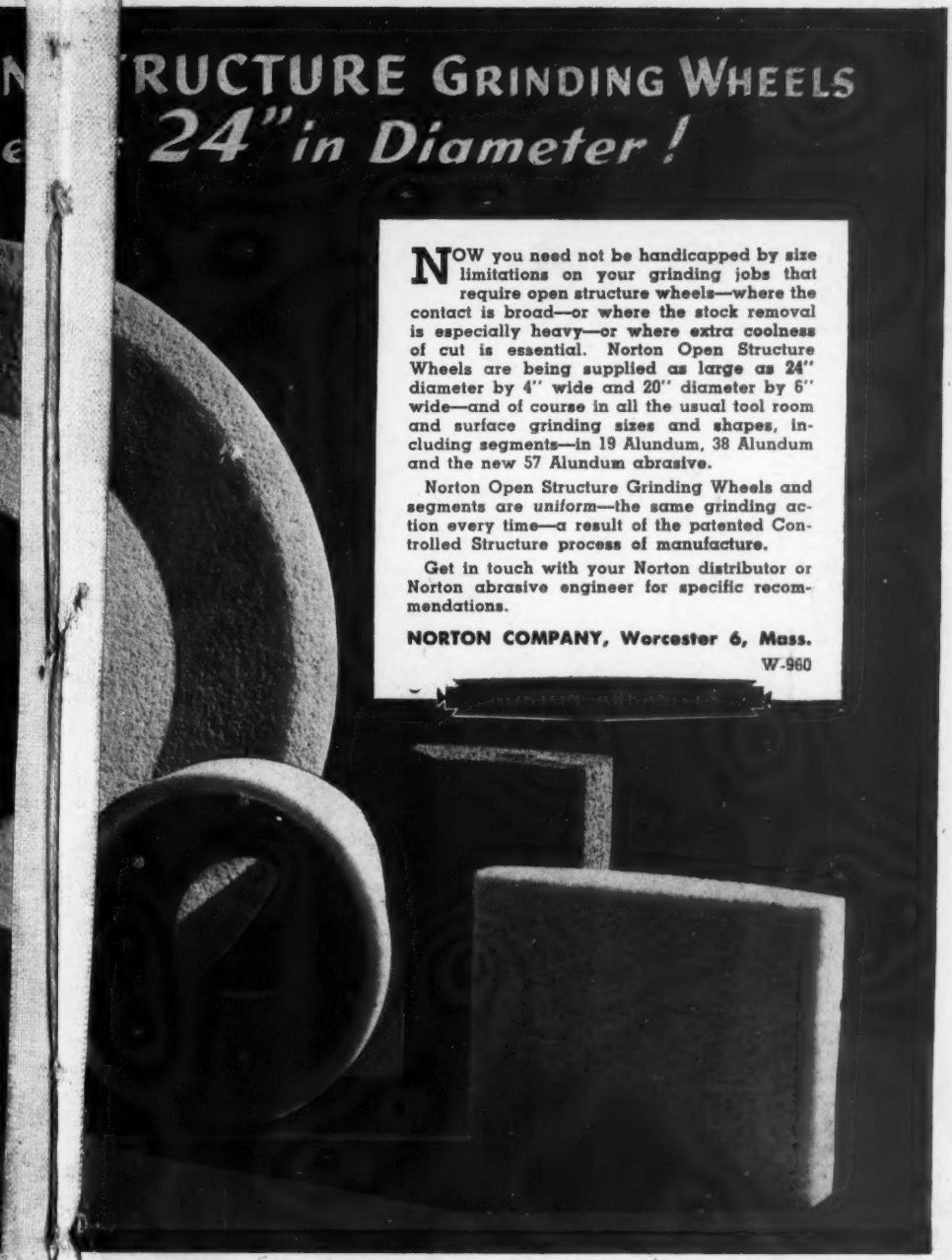
The STANDARD Super Snap Gage with its SPHERICAL gaging pins eliminates out-of-parallelism. This new spherical-contact principle involves no condition of sustained parallelism. The SUPER Snap Gage is easily set, requiring no simultaneous adjustment to a given dimension and to parallelism. It simplifies inspection, assures greater accuracy.

The return of out-of-parallel snap gages for correction is eliminated. Only pins and anvils need be held in reserve, instead of complete gages. The initial cost of the SUPER Snap Gage is no more. Pins are available as separate parts, to fit existing American Gage Design models.

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Norton Open Structure Grinding Wheels and segments are *uniform*—the same grinding action every time—a result of the patented Controlled Structure process of manufacture.

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5 Cuts Simultaneously!



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(Patent applied for)

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The segments permit "breathing" . . . and allow for expansion or contraction due to temperature changes, with no distortion to the Carboloy gaging member.

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Used Ball Bearings Perform Vital War Duty!

By ROGER W. BOLZ

Assistant Engineer, National Carbon Company, Inc.,
Clarksburg, W. Va.

IN MOST industrial plants can be found many pieces of mechanical equipment operating with ball bearings which, if the machines are to continue operating properly, must be in perfect condition. Much of this equipment, including motors, motoreducers, traveling cranes, hoists, and so on requires overhauling and inspection at regular intervals, at which time all bearings that show any excessive wear are replaced.

These worn bearings should not be discarded! Many of them can be returned to service to perform vital war duty.

After they have become too badly worn to be of use in high speed or precision machines where perfect ball bearings are a necessity, the worn bearings can be applied to machines which operate more slowly, or to replace sleeve bearings which have themselves become too badly worn for further use, where precision is not a prerequisite. The scarcity of first quality bearing bronzes is a further incentive to the reclamation of ball bearings, where such reclamation is feasible.

For many applications, a slightly worn set of ball bearings, perhaps salvaged from the scrap pile, can be installed without sacrifice of accuracy. As illustrated in the drawings Fig. 1 and 2, the bearings can be set up to operate as a pair of preloaded duplex-type bearings. This arrangement allows easy take-up adjustment for the preloaded operation of the races by the use of either shims or locknut.

A similar installation is illustrated in Fig. 3, which shows two used radial ball bearings mounted back to back and properly preloaded by shimming. Careful installation and accurate adjustment of the preload will ensure good performance and bearing life.

The most important step in the procedure of reclaiming a used set of

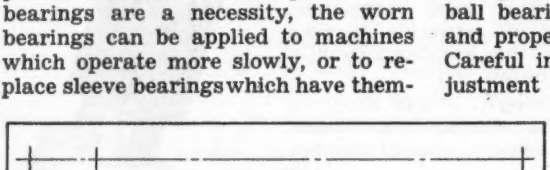
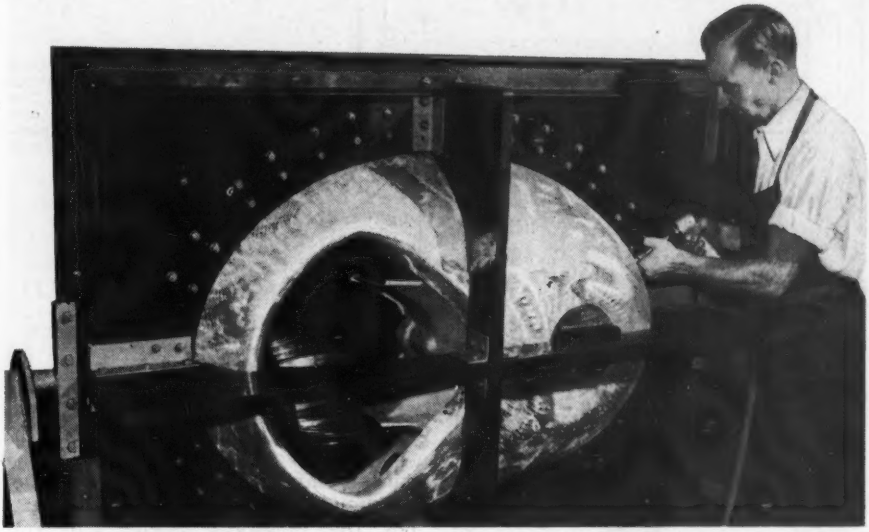


Fig. 1—Lock Nut Adjusts Inner Races to Load Balls Against Outer Races, Duplicating Operating Conditions of Angular Contact Races. Large Lubricant Reservoir Provides Adequate Oiling

More MASONITE* DIE STOCK means less weight, time and cost



A great deal of Masonite Die Stock is used in this jig for assembling the nose cowl of a plane at Fairchild Aircraft, Division of Fairchild Engine & Airplane Corporation.

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You save time and money with Masonite Die Stock because this material, thickness for thickness, is a fraction of the cost of metals—because of the speed with which it can be worked with either metal-cutting tools or with high-speed pattern shop equipment.

Today, you find this modern die stock widely used in aircraft plants throughout the country. And it has also become a prime favorite of other fabricators of thin-gauge metals who want to do a *faster, better job at less cost.*

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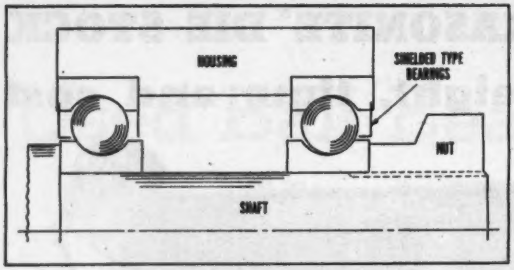


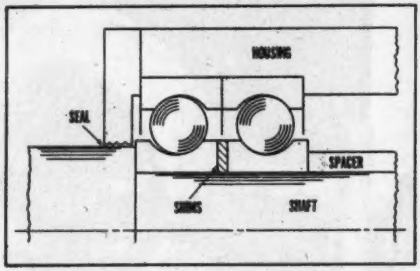
Fig. 2 *(Left)*—This Arrangement is Similar to that shown in Fig. 1. Here Single Shield Bearings are Used to Obviate the elaborate End Bells and Labyrinth Seals Required to hold the Lubricant

Fig. 3 *(Below)* — Two Discarded Bearings, Reclaimed and Operated as a Pair of Duplex-Type Races. The Proper Preload is Determined and Applied by Use of the Correct Thickness of Shim Stock, as Indicated

ball bearing is the cleaning. The bearing should be thoroughly soaked in kerosene first, to remove all old grease and accumulations of foreign matter. Once cleaned, all parts of the bearings should be thoroughly dried with an air hose and immediately well oiled, as specified by the manufacturers of ball bearings.

The parts, especially the balls and bearing surfaces of the races, should not be touched with the fingers, but should be handled with light tongs made from narrow strips of light sheet metal. After cleaning, the bearings should either be installed or wrapped in oiled paper until installation. In no case should bearings with spalled or chattered raceways be used, since smooth operation would be impossible.

The housings for the bearings should be of generous size to provide adequate lubrication capacity for the races. In order to safeguard the raceways against overheating, care should be used in setting up the preload in



the assembly. There should be no appreciable axial float in the shaft, but the raceways should still roll quite freely. Extreme care at this point will pay good dividends as overloaded races will deteriorate very rapidly, even at moderate speeds.

The procedure outlined here has been put into practice in our own plant, and has proved efficient and satisfactory.

Mairzy doats and warzy dough.
Buy Victory Bonds and beat the foe.



KEENER CUTTING SAWS

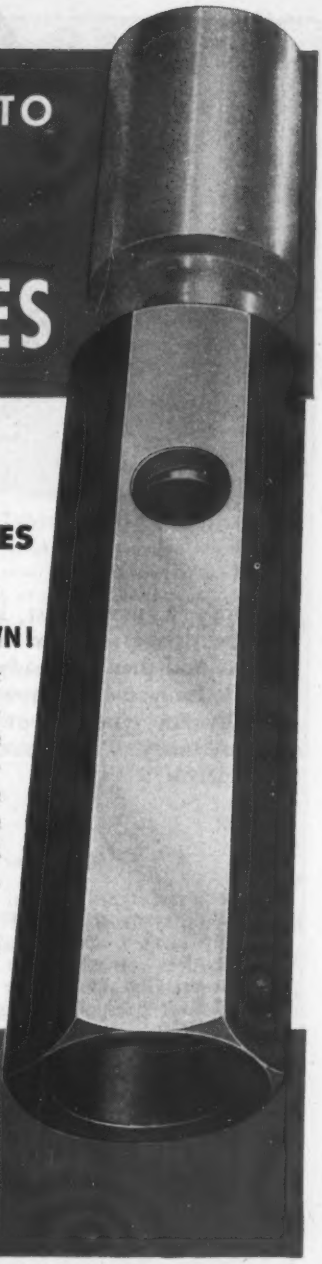
Sharpen your hack, band, or slitting saws on a Howe-Lindsey Automatic Saw Sharpener and increase their life at least six times.

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These are made of oil-hardened tool steel with the taper-shanks ground and the body rough turned .010 above the standard 1/16" steps.

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Apex insert type bits cut down the many different sizes of Phillips bits usually needed. Once you've bought the holders you need, you carry only the insert tips. One range of inserts fits various sizes of holders.

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Apex insert tips are small, release vitally needed steel for other war uses.

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Insert bits last longer because the float between the holder and insert permit easier direct alignment with recess in screw.

Saves Handling

It's no longer necessary to return used driver bits for reconditioning. Cost of new inserts amounts to approximately the same as reconditioning charges.

Get the whole line-up on these thrifty, time-saving Apex bits, and the holders to fit practically all makes of drivers. Write for Bulletin *102*

APEX

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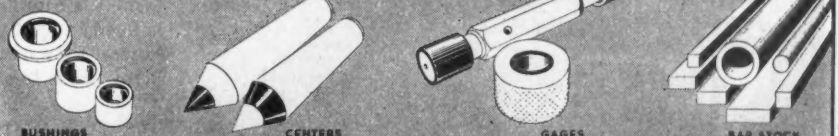
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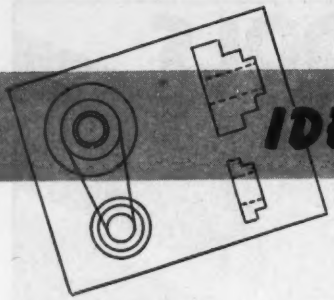
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IDEAS FROM READERS

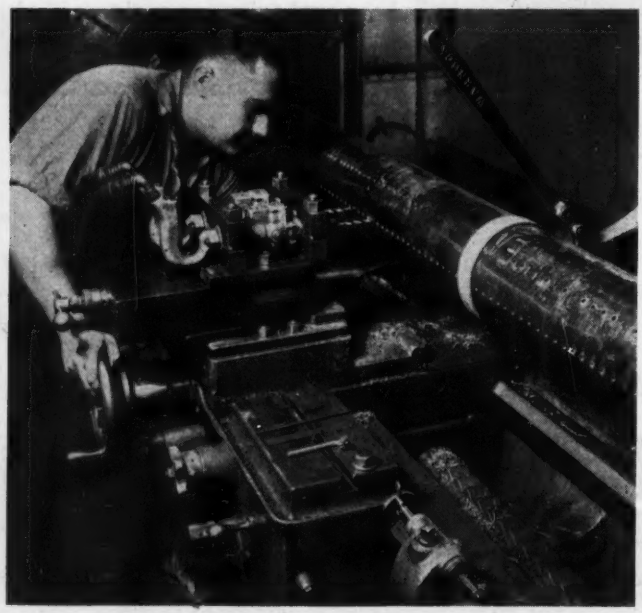
Engine Lathe Solves Drilling Problem

By J. BOHAN
Steam Division, Westinghouse Electric & Mfg. Co., South Philadelphia, Pa.

THE illustration shows how an engine lathe was used to solve a problem of drilling rows of holes in pipe sections which otherwise would have required either a laborious layout job or an expensive jig.

The pipes—drain pipes for surface condensers—are 6 inches in diameter and 18 feet 6 inches long, and require the drilling of 6 rows of 200 holes each. The holes must be in perfect alignment and equally spaced.

Using the usual bull centers to obtain perfect alignment, each pipe section was swung betweeen the centers of a lathe, as shown. The drilling was done with two air drills, held in a holder especially designed for the purpose and clamped to the slide rest of the lathe. The drill units were correctly spaced so that the correct dimension between the holes could be maintained. Hand feed is used to spot the holes, then the lathe cross feed is



Using an Engine Lathe, Equipped with Micrometer Stop for Spacing and two Air Drill Units for Drilling, to Drill Rows of Holes in Drain Pipes for Surface Condensers

HOW TO IMPROVE ACCURACY AND STRENGTH OF SPLINES

AT NO INCREASE IN COST



Here stronger—involute—splines are being finished on a Michigan Gear Shaver at 70-80/hr. to virtually zero backlash (tolerances: 0.0001-0.0002"). The saving in hobbing cost alone offsets the expense of the shaving operation.

For complete information on gear finishing, ask for Bulletin GF-43

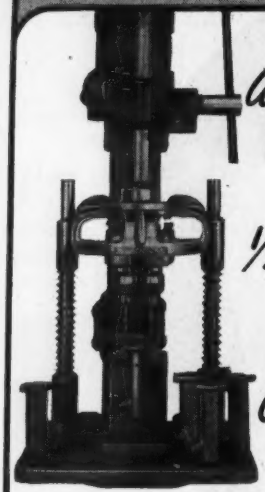
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✓ *Adjustable Centers from ½" to 6"*

✓ *Drill Capacity 0 to 5/8"*

Sleeve and overarm types . . . in several sizes. Will double output of any single spindle drill press.

Quickly adjusted to desired drill centers from ½" to 6".

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engaged and the holes are finished by power.

With this setup it is necessary to lay out the first hole of each row only, a micrometer stop attached to the lathe way being used in conjunction with block, plug and pin gages to obtain accurate spacing. To move from one row to the next, it is only necessary to revolve the face plate by hand and align the point of the drill to the layout for the first hole.

Clamp and Bolt Stand

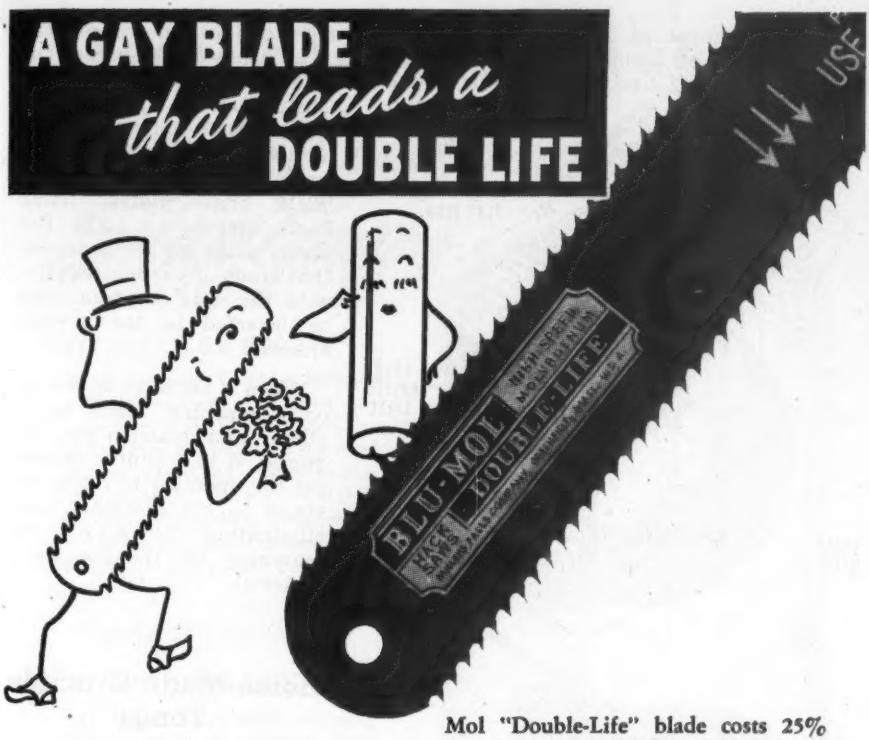
By C. F. Fitz

A LARGE part of the time that is lost in any shop can be charged against the task of setting up work on machines with the aid of clamps and bolts, even when it is unnecessary to hunt for clamps and bolts of the proper sizes for the work. We reduced this waste in our own shop by first designing and making a set



Home-Made Clamp and Bolt Stand

A GAY BLADE *that leads a* DOUBLE LIFE



Sounds fantastic, doesn't it? But Blu-Mol "Double-Life," a Millers Falls exclusive, is a *high speed* machine blade that actually leads a *double life.* When one edge is worn out from long toil, just turn it over and go right on sawing. The special set differential eliminates drag and wear on the trailing edge. One Blu-Mol "Double-Life" blade costs 25% less than two molybdenum high speed blades and 47½% less than two tungsten high speed blades. The saving is worth-while.

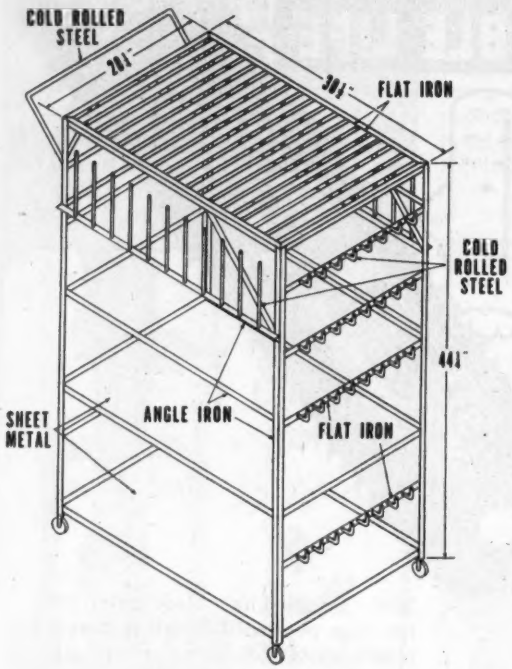
"Double-Life" blades, while more efficient and economical, are also aiding the drive toward Victory by saving in alloy steel consumption, shipping, storing and handling. Put in your requisition now.

DOUBLE-LIFE *Hack Saws*

MILLERS FALLS TOOLS SINCE 1868

MILLERS FALLS COMPANY
GREENFIELD, MASSACHUSETTS

of standard camps, as described in a previous issue of MODERN MACHINE SHOP, then making a rack to hold this equipment. The rack is illustrated in the photograph and drawing herewith.



Drawing of Clamp and Bolt Stand

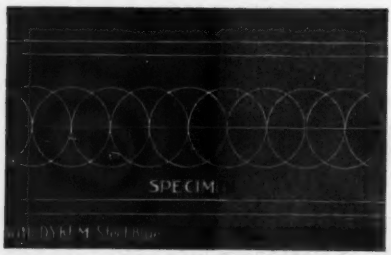
The stand is made from angle iron, flat iron, and sheet iron, according to the specifications shown on the drawing. The hooks on the end of the stand hold the flat clamps in pairs. The pins on the side hold hexagon nuts, T-slot nuts, sleeve nuts, and washers. The shelves provide space for wedges, parallels, angle plates, clamp heels, and so on. The flat strips on the top are so spaced that studs of various lengths, with the nuts on them, may be inserted in the several spaces.

When a job is to be set up on a machine where bolts, studs, and clamps are required, it is a simple matter for the operator to move the stand to his machine, thus eliminating the need for searching for the necessary material.

Home-Made Crucible Tongs

By A. H. WAYCHOFF

OFTEN a user of small crucibles will ruin a crucible by trying to handle it with a large pair of pliers or tongs that grip the crucible over the side wall. Further, not all users of crucibles have crucible



DYKEM STEEL BLUE

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Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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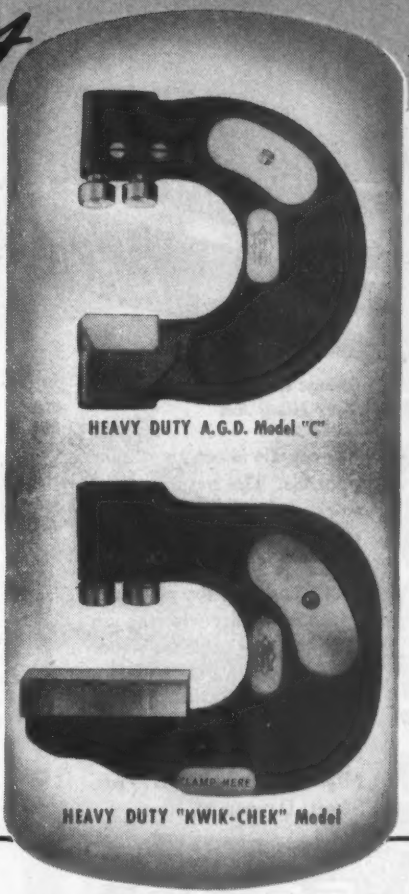
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Acclaimed for its ability to maintain accuracy even with hard usage. The contact anvils and gaging buttons are of hardened and tempered tool steel, ground, lapped and adjusted to size. They are held in place by an A.G.D. Locking Device. Assures quick and accurate inspection of duplicate parts. Round or square head buttons optional.

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HEAVY DUTY "KWIK-CHEK" MODEL

Ideal for ease and speed in gaging odd or irregular-shaped pieces. Note the lower anvil extending beyond back edge of top gaging button for aid in gaging counter-bored work, and in lining up work before presenting it to the gaging anvils. An excellent gage for checking end measurements of any kind.



HEAVY DUTY A.G.D. Model "C"

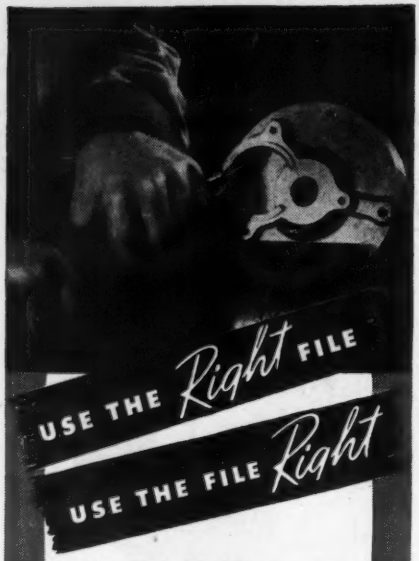
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Things to Remember on ANY Filing Job

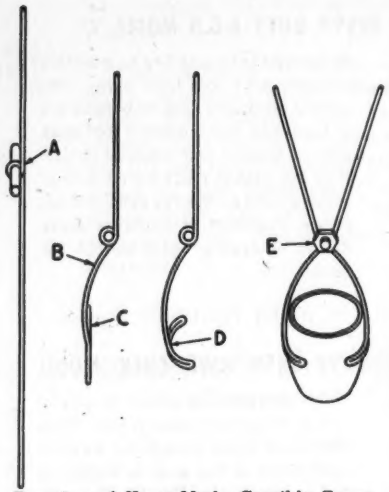
• Every file is not an all-purpose file. The nature of the work determines the most efficient file to use. Choose carefully the correct type, shape and size for *your* use. Speeds will vary with the job —the smaller the file the higher the speed. Move the file at an even rate and pressure. The Right file is the Ford file. Send for catalogs. M. A. Ford Mfg. Co., Inc.,—744 W. First Street, Davenport, Iowa.

FORD

The mark of a GOOD file

tongs of the proper design, as they are both expensive to buy and usually hard to make. However, by following the instruction given here, one can make a perfectly dependable set of tongs in a short time.

The pair of tongs is made from iron or steel rod of perhaps $\frac{3}{16}$ inch diameter for crucibles up to five inches diameter and $\frac{3}{8}$ inch diameter for crucibles up to eight or ten inches diameter. The length depends upon the size, and will have to be determined by the user.



Drawing of Home-Made Crucible Tongs

About two-fifths of the way from one end each rod is wound around a similar section or pin to obtain a loop as shown at **A** in the drawing. The longer end is then formed by hand as shown at **B** so that when the finished tongs are closed around the crucible they will not touch the top edge. By bending the rod at right angles and then doubling back again, as shown at **C**, and forming a curve in this part as shown at **D**, one-half of the tong is made. The curve should fit the crucible just below the mid-

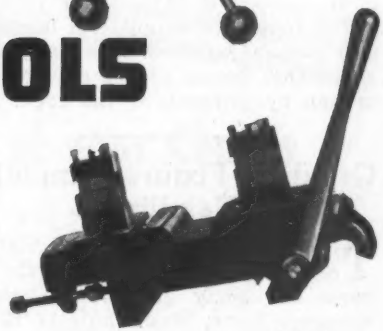
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UTILITY TOOLS

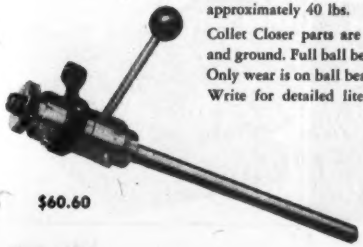
In a matter of minutes you can convert your engine lathes into screw machines. Simply remove tail stock and install a Utility Turret and Crossfeed Cut-off. Turret has rack and pinion which assures steady feed. Raised bearing surface eliminates all chip trouble. Has two taper gibs for take-up and alignment. All ways and bearing surfaces are ground. All inserts, bushings and pins are hardened and ground. Hex is 5⅛" across flat, 2-7/16" thick. Accommodates a ¾" hole or a No. 1 or 2 Morse taper. Fits Logan, South Bend, Atlas, Craftsman, 10" Sheldon, Clausing, etc.



$55.00

Cross Slide pictured here has rack and pinion, two tool holders with adjustable jacks. Weight approximately 40 lbs.

Collet Closer parts are hardened and ground. Full ball bearing. Only wear is on ball bearings. Write for detailed literature.

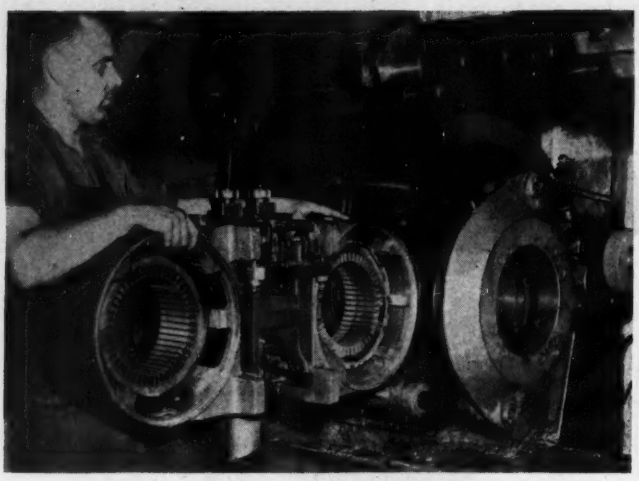


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Loading and Unloading Fixture on Grinding Machine Simplifies Handling and Saves Time

dle, or greatest diameter. When the two halves have been assembled with the aid of a bolt, nut and perhaps a couple of washers, the set is complete.

The tongs are simple and inexpensive to make, and will save many crucibles that would sooner or later be broken by gripping at the edge.

Grinding Fixture Simplifies Handling

TO HOLD Tri-Clad motor stators on the grinding machine while the bores are being ground at General Electric's Lynn, Massachusetts, River Works, the machine is equipped with the special pivot-type loading and unloading fixture shown here. The advantage of this double fixture consists in that it can be unloaded and loaded during the grinding cycle, eliminating practically all of the handling time.

The illustration shows the fixture just after it has been pivoted by the operator. The stator core at the left has been ground, and the one at the right is being swung in between the machine clamping rings. After the clamping rings have been applied and the stator is securely anchored in position, the fixture will be swung back out of the way and the grinding operation will be started. During the operation, the completed stator will be removed from the fixture and replaced with an unground one. The other part of the fixture remains empty so that it may be used to re-

WALTHAM

Pinion and Gear Cutting Machines

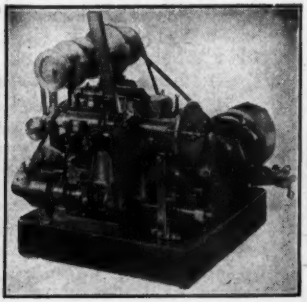
Not excelled on high production requirements in cutting small gears and pinions up to 1½ inch pitch diameter for watch or instrument work. Revolving cutter makes successive cuts on blanks held and indexed by work spindle and usually supported by a tail center. Only straight teeth can be cut.

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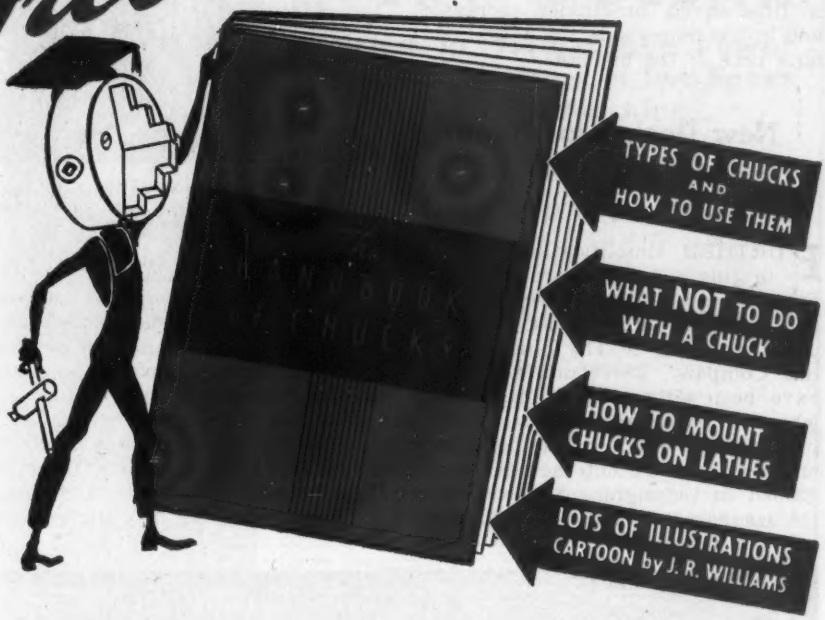
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For the sake of your Chucks, see that every young machinist has a copy of this Handbook. It's "chuck-full" of facts and pictures, practical down-to-earth material that may be worth hundreds of dollars in time and Chucks saved. Written for beginning machinists and students . . . but old-timers will get a kick out of "Mr. Must-Bust-It" and a special cartoon by J. R. Williams. Your copy is free. Quantity requests will be honored, if on Company letterhead.

Write



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PRECISION · DEPENDABILITY · SERVICE

move the stator being ground.

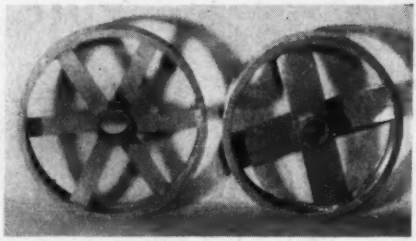
The fixture is easily operated, and has paid for itself several times over in time saved, production increased, and in the increase in the actual running time of the machine.

New Design for Hand Truck Wheel

Reduces Welding By 75 Per Cent

FURTHER simplification of parts originally built by arc welding is saving a great deal of time, money and material on countless war products, according to The Lincoln Electric Company, Cleveland, Ohio, who have been advocating such redesign wherever practicable.

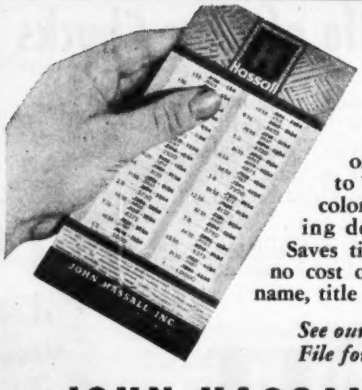
To illustrate, one of the company's engineers pointed out the advantages gained in redesigning the wheels of the company's welding machines. An



The Truck Wheel shown at the Left was Redesigned as shown at Right, thus saving 16 Welds.

interesting comparison of the two welded wheels shows that the number of pieces per wheel was reduced from 8 to 4, with an even more impressive reduction in the amount of welding necessary.

The old style wheel shown at the left in the accompanying illustration needed 24 separate welds, the spokes being fused to the rim and hub on both sides. In the new design (right



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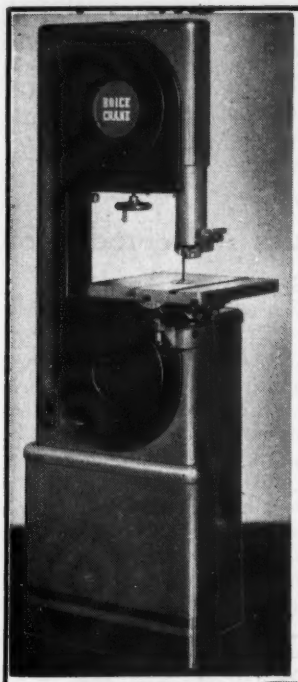
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for fast, free cutting of metal, wood, plastic and paper up to 8⅝" thick and 27" diameter. Fine work reduces sanding costs on end cuts.

Quiet. Vibrationless.

The single knob control adjustable guide handles blades from ⅛" to ¾".

Top rated by State Safety Commissions.

Wheel guard must be closed to operate.

Telescoping blade guard held by friction when lock handle is released.

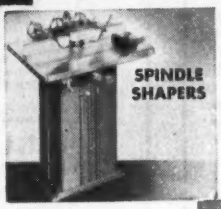
Heavy duty gears transmit up to 1 H.P. at lowest speed with full safety. All gears run in oil.

15" x 15½" table tilts 45° to right, 10° to left; convenient scale indicating degree of tilt. Two large trunnions prevent sag under heavy cuts.

Single and 8-speed bench and floor models. All moving parts, including motor, on floor models fully enclosed and dust-sealed.

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in illustration) simplification of construction is apparent, there being only eight welds required and these on one side of the structure.

An interesting angle was worked out in the new design whereby one of the spokes was positioned so that it contacted the rim at the seam. Thus only one weld was necessary at this point to join both the rim section and the spoke.

The new wheel is 12½ inches in diameter, has a 1⅞ inch diameter hub, and 2½ by 11½ inch strap material of ⅛-inch thickness for the spokes. These pieces are slightly curved for maximum rigidity and for proper fit inside the rim.

Electronics Aids Production

By G. A. CALDWELL
Engineer, Westinghouse Electric and Manufacturing Company

MACHINING operations involving irregular surfaces, such as propellers, dies and cams, have in the past often required expensive and time-consuming hand labor—chipping, grinding, polishing. As might be expected, the final result was not always as exact as it might have been.

A new tracer mechanism, with the Westinghouse Silverstat regulator as is operating medium has already been



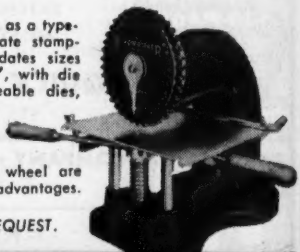
2¼x HEADBAND MAGNIFIER
Use of both eyes reveals true depth of details. Magnification of 2¼x. Free working distance, 8" to 10", permitting unhindered use of hands. By just lifting your head, your eyes are free for any other activity. Eyeglasses may be worn while using. Highest optical quality.
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BY A QUICK, EASY, INEXPENSIVE METHOD
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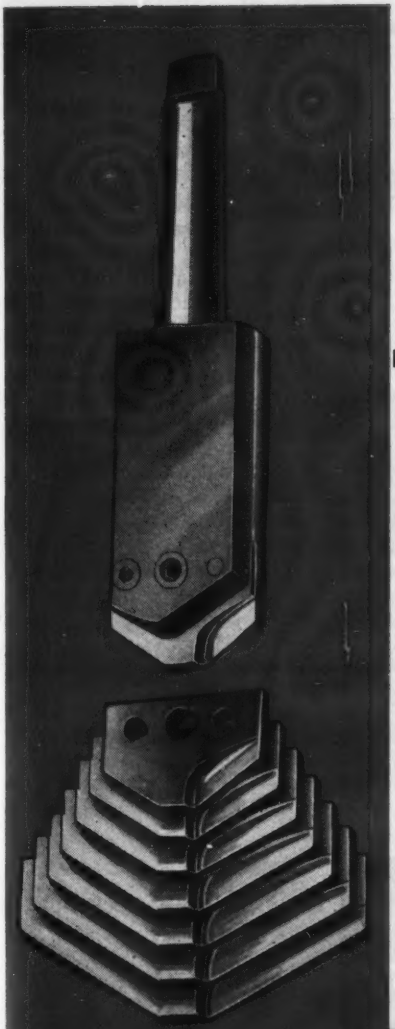
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solves nameplate stamping problems!
ACROMARK

★ As simple to operate as a typewriter, this nameplate stamping machine accommodates sizes up to 9" x 8" x 2½", with die sizes to ⅜". Replaceable dies, table lock for adjustment, automatic advance for character spacing and double-row, ball-bearing die wheel are a few of the extra advantages.



LITERATURE ON REQUEST.

THE ACROMARK CO., 9 Morrell St., Elizabeth, N. J.



Showing how various standard size CONNER drill tips are interchangeable and accommodated in constant length holder.

Now . . .

A MULTI-TIP DRILL!

CUTS YOUR DRILL INVESTMENT Over **90%** **IN INVENTORY AND STORAGE SPACE**

Here's the new advance—the new development for larger sized drills you've been waiting for—the **Conner Multi-Tip Drill.** Comes in standard taper-shank holders. Standard drill tips are furnished to drill from the solid. Each holder will accommodate several interchangeable drill tips (standard size). These tips are made of hardened high-speed steel in steps of 1/16". Special holders and special sizes also available, permitting many extensions.

For special applications, one design permits oil under pressure to be flushed directly on the cutting edge of the drill tips by having an oil hole through the shank and forking out to each lip of the drill. Then there are extensions for deep hole drilling with cross slots on the end which fit the rectangular section of the holder—thus taking all the strain off the tang. Any type or size shank can be furnished, straight for fitting directly in turrets, or tapers for spindles.

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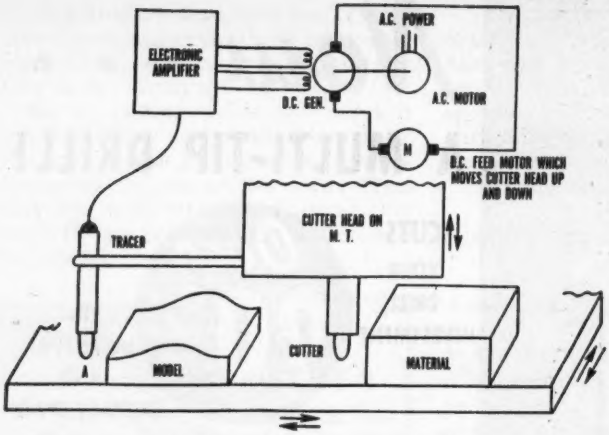
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Please send me literature on MULTI-TIP DRILLS.

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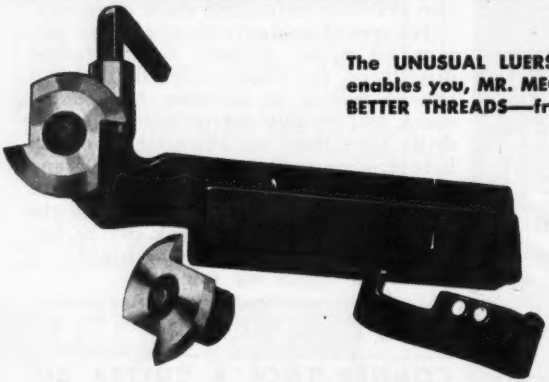
CITY_____ STATE_____



This schematic drawing illustrates the operation of the tracer

applied successfully to several such operations. In operation, a probe, mounted in connection with the Silverstat, is used to follow the contour of an accurate model—either actual size or to scale. As the probe is moved across the model, it affects the position of the Silverstat. Through an electronic amplifier, the cutting tool is moved correspondingly with respect to the work.

The accuracy of the tracer mechanism is such that, with a well designed machine tool and an actual size model, the contour of the model can be duplicated within two or three thousandths of an inch when feed speed of twenty to thirty inches per minute is used.



The UNUSUAL LUERS Patented Threading Tool enables you, MR. MECHANIC, to chase threads—BETTER THREADS—from 25% to 50% FASTER.

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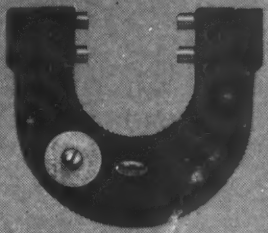
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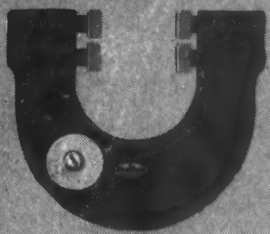
State Frame Model and Frame Size. Stipulate whether gage is to be set and sealed. Give complete marking instructions if set and sealed. For specifications see Sheffield Handbook No. 42-2, pages 150-153.



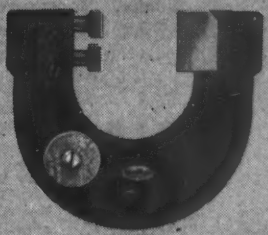
AGD MODEL SMC



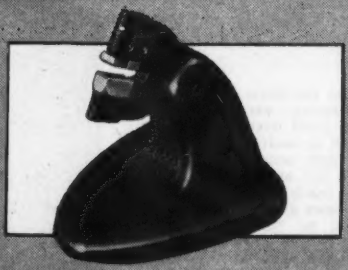
AGD MODEL A



AGD MODEL SB



AGD MODEL SC



SHEFFIELD SNAP GAGE STAND



THE SHEFFIELD CORPORATION

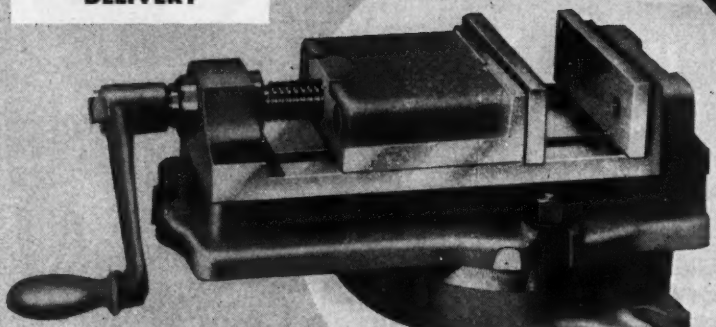
Dayton 1, Ohio, U.S.A.

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Suitable for milling machines, drill presses, shapers, etc., these large semi-steel vises may be used plain or swivel. The steel jaws are sturdy. Key slots provide for attachment to machine table holding surface, with jaws at right angle or parallel to table. Junior 4¼" size, 45 pounds..... $23.60

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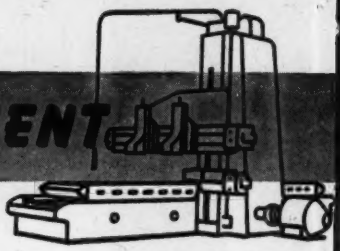
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NEW SHOP EQUIPMENT



Barnesdril Special Hydraulic Production Drilling Unit

The Barnes Drill Co., Dept. 84, 814 Chestnut St., Rockford, Ill., announces the completion of a special hydraulic production drilling unit which can be arranged for drilling, reaming, facing, boring, counterboring, or tapping operations in any one or combination of horizontal, vertical, or angular positions.

The unit is available in three sizes (Nos. 5, 10, and 20), each being motorized according to the requirements of the job. The No. 5 can be equipped with a 5 to 7½ h.p. motor, the No. 10 with a 10 to 15 h.p. motor, and the No. 20 with a 20 to 25 h.p. motor. The Nos. 10 and 20 sizes each have essential working parts built-in complete with a single motor driving the spindle and hydraulic pump for any automatic hydraulic feed cycle. The No. 5 size is equipped with a separate motor-driven hydraulic system.

The Barnesdril Special Hydraulic Production Drilling Unit is arranged to provide rapid approach, variable feed, and quick return. Used vertically as shown in illustration Fig. 1, the unit is capable of performing simultaneous drilling, reaming, and counterboring operations. The unit can also be arranged vertically in combination with angular and horizontal applications. Vertical arrangement of several units around a rotating indexing table is said to result in savings in machining and handling time by combining several operations.

Barnesdril Units can be arranged for horizontal operations either as single units grouped around an indexing table, as illustrated in Fig. 2, or in combination with vertical and angular applications. Each unit has a flange support for mounting interchangeable auxiliary heads with any desired number and arrangement of spindles. According to the manufacturer, one standard unit equip-



Fig. 1 — Barnesdril Special Hydraulic Production Drilling Unit arranged for Vertical Reaming and Counterboring with Unit around a Rotary Indexing Table

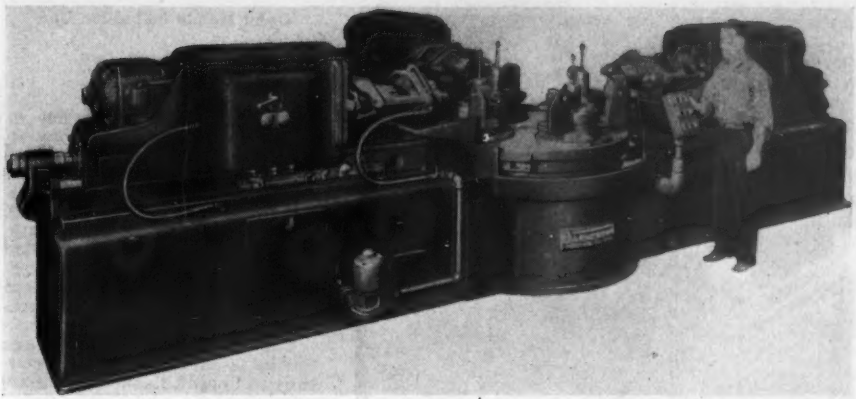


Fig. 2—Barnesdril Hydraulic Production Drilling Units arranged for Horizontal Operations

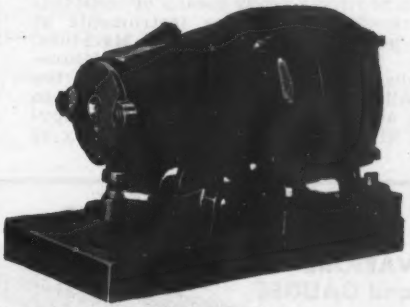
ped with an eight-spindle auxiliary head and used horizontally as a self-oiling production unit is capable of facing and counterboring as many as eight bosses simultaneously.

Barnesdril Special Hydraulic Production Drilling Units can be furnished suitably mounted on proper columns, horizontal beds, supports, hydraulic indexing tables, and other elements as machines complete in themselves. The hydraulic system of the built-in motor on the Nos. 10 and 20 sizes is automatically cooled by a fan blower mounted on the shaft in front of the motor. Efficient machining of the work together with long life of the cutting tool is effected by a motor-driven chip conveyor which

SAVES TIME—SAVES MANPOWER and INCREASES Production!

That's what the PRECISION WIRE STRIPPER is doing today for hundreds of war production plants throughout the U. S.—AND IT WILL DO THE SAME THING FOR YOU if wire stripping problems now confront you.

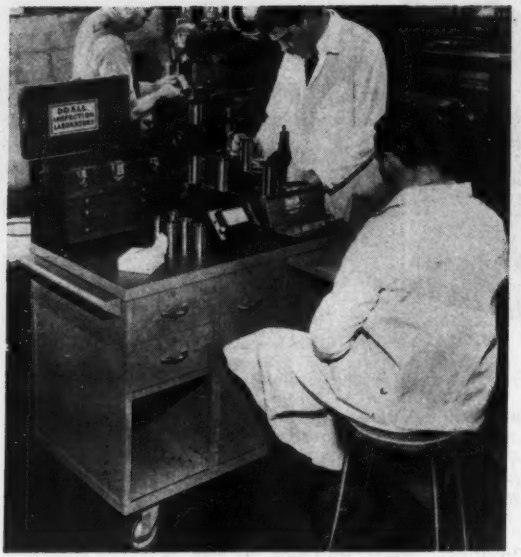
In a twinkling, this ruggedly built precision instrument removes insulation from the ends of solid, stranded or multi-conductor cable and wire up to a half inch in diameter AND IT DOESN'T REQUIRE A SKILLED OPERATOR.



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WEBER MACHINE CORPORATION

59 Rutter St. **Rochester 6, New York**



automatically removes chips from the indexing table and deposits them in a receptacle at the rear of the machine. All controls are located on one side of the unit, convenient for the operator.

DoAll Mobile Inspection Unit

To provide a ready means of constantly checking measuring instruments at the point of use, Continental Machines, Inc., 1306 S. Washington Ave., Minneapolis 4, Minn., has brought out the DoAll Mobile Inspection Unit shown in the accompanying illustration. Occupying little more than an area of 24 x 42 inches, the unit makes use of light waves, produced by a monochromatic light and viewed through an optical flat, as basic standards of measurement. A set of DoAll gage blocks, gaging instruments, and comparator are provided for interpreting this unwavering standard of measurement in checking dimensions of parts and tools.

The set of 83 precision gage blocks is said to have an accuracy in height, flatness and parallelism of plus or minus 0.000004 inch. A calibration chart lists height, flatness, and parallelism of these blocks. The set of 20 different precision measuring instruments furnished includes calipers, trammel points, center points, scribers, base blocks, gage holders of 2, 6, 9, and 12-inch capacities, vernier gage block, master square, sine bar, straightedges, master flat, and 12 x 24-inch precision surface plate.

The comparator gage supplied with the DoAll Mobile Inspection Unit has four ranges of magnification, 6½-inch height gaging capacity, 4-inch throat capacity, and variable spindle pressures of from 8 to 40 oz. Equipment of the DoAll Mobile Inspection Unit also includes an illuminated magnifying glass mounted on stand. Accuracy of the Unit's instruments against wear, dirt, and rough handling can be quickly checked by using the optical flats and monochromatic light.

The DoAll Mobile Inspection Unit is strongly built of steel to safeguard instruments and prevent warping or twist-

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VARIOUS WIDTHS and GAUGES
BUTTS AND CONTINUOUS LENGTHS
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Your *Threadwell* distributor was selected because he proved himself ready and able to give personal and efficient attention to your tap requirements.

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Color "i-dot-ification" — type of tap instantly identified by *red* dot for cut thread, *white* dot for commercial ground, *blue* dot for precision ground.

The "tap-capsule" in which every *Threadwell* ground thread tap is individually sealed and protected but visible for size and style without unwrapping.

Greaseless rust-proofing — always shining, always clean, always easy to handle.

Polished flutes which speed chip removal and help prevent breakage.



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ing. The working surface is covered with heavy duty linoleum which is said to provide a scratchproof, smooth, and shock-cushioning area that is easy on tools and gaging instruments. A small ledge or bead ⅛ inch high surrounds the work table to prevent instruments from sliding off the working surface.

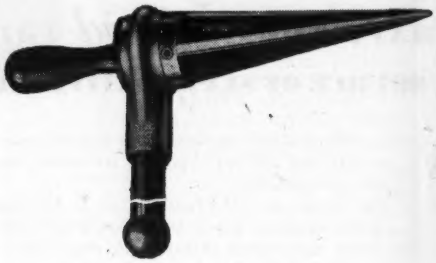
The DoAll Inspection Unit is easily moved throughout the plant on four rubber-tired, heavy duty caster wheels which can be locked when the unit is in use. A plug-in box is provided at the back of the unit to supply electricity for the monochromatic light, electric comparator, and magnifying glass. This box contains a 50-foot extension cord that is fastened to an automatic take-up reel.

The DoAll Mobile Inspection Unit contains storage space for all of the precision instruments and gages provided, as well as ample room for plug gages, sets of wire measuring rods, micrometers, and other measuring instruments. In addition, the unit includes a pull-out desk and drawer for making and filing inspection records respectively. A collapsible chair, which enables the inspector to sit at the desk in writing his reports, is also furnished with the unit.

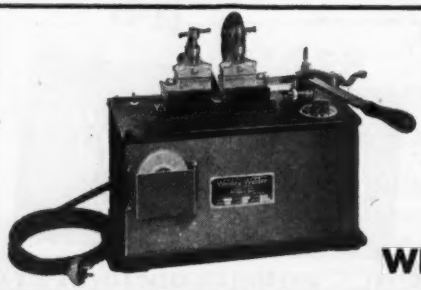
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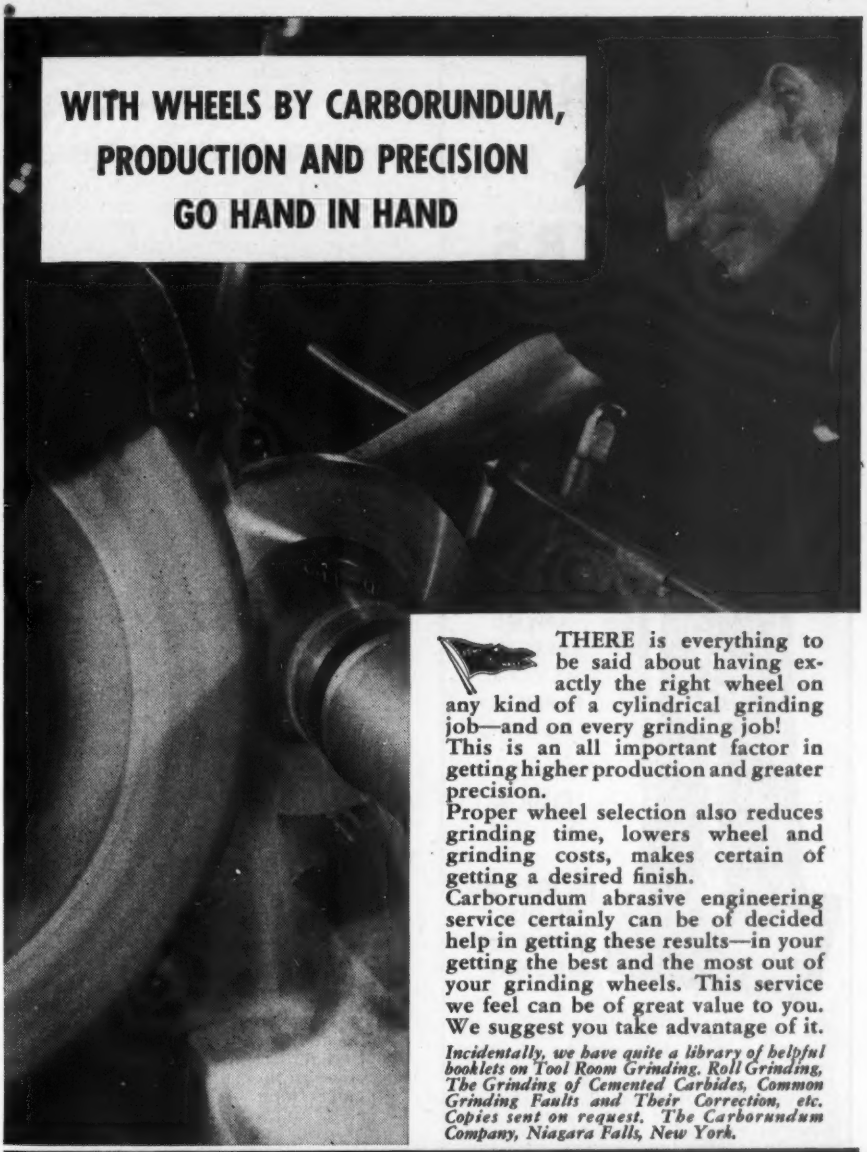
"Ridgid" Long-Taper Pipe Reamer

Addition of a pipe reamer of extra long taper design to its line of "Ridgid" products is announced by The Ridge Tool Co., Elyria, Ohio. As a result of the long taper, the reamer is not only claimed to avoid flaring, splitting, or reducing wall of pipe but to cut burr cleanly and easily from the inside of pipe or conduit. It is furnished with



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Incidentally, we have quite a library of helpful booklets on Tool Room Grinding, Roll Grinding, The Grinding of Cemented Carbides, Common Grinding Faults and Their Correction, etc. Copies sent on request. The Carborundum Company, Niagara Falls, New York.

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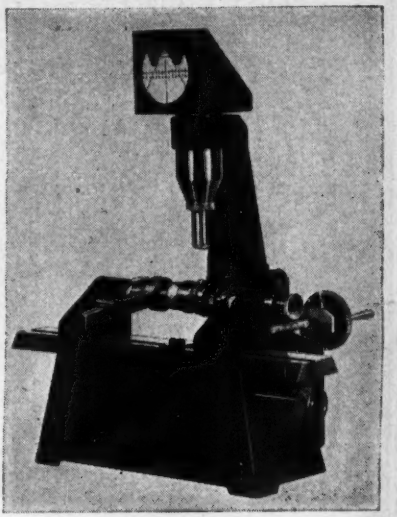
This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

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1806 BELLE PLAINE AVE.
CHICAGO 13, ILLINOIS

ratchet handle or can be used with the ratchet handle of "Ridgid" No. 00R ratchet threader.

Acme Thread Pick-Up Projector

A thread pick-up projector announced by Acme Industrial Co., 212 N. Laflin St., Chicago 7, Ill., is said to greatly increase the productivity of thread grinders, effect important economies in time, material, and man power, and improve the quality of ground threaded parts. The unit is an optical device for presetting the driving dog on prethreaded work so that when such work is placed in the grinder, the grinding wheel enters the "V" of the oversize thread to remove finishing stock from both flanks without further adjustment. Inspection of thread angle and root depth is made in the same setting by means of graduations incorporated in viewing screen at top.



Acme Thread Pick-Up Projector

Ruggedly and accurately constructed, the projector, according to the manufacturer, is designed to enable beginners to "pick" the thread after but a few minutes demonstration. The unit accommodates work up to 4½ inches in diameter and 12 inches long and, it is claimed, will operate in conjunction with

More Speed for every hand tool operation . . . Snap-ons deliver it . . . with less effort, greater accuracy and utmost safety! In hundreds of plants engaged in critical war production, Snap-ons are standard tool equipment . . . *the choice of better mechanics* throughout industry. 3,000 modern Snap-on tools provide a wide selection for production, assembly and maintenance operation. Snap-on offers direct-to-user tool service through 37 factory branches in key production centers. Write for catalog!



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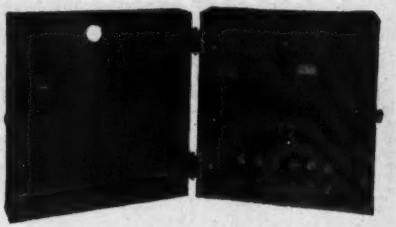
any thread grinder. The image is unusually brilliant, being clearly visible even in rooms brightly illuminated by sunlight. No hood is required.

The projector screen is ruled with a 60-deg. "V" plus other graduations to indicate depth of root on American National threads. Supplementary graduations on the same screen permit Acme and Whitworth threads to be picked up. Special screens for these thread forms and other profiles are also available.

General Electric Current-Regulating Compensator for Resistance Welders

A current-regulating compensator for resistance welding machines has been announced by the electronic control section of the General Electric Co., Schenectady, N. Y. The compensator is specifically designed to facilitate the production of consistent welds by holding the rms., or true heating value, of the weld current constant for any heat-control setting without continual manual adjustment.

After the predetermined heat-control setting for a particular job has been made on the compensator, it requires no further adjustment. According to the manufacturer, the compensator will hold the welding current to a variation of



General Electric Current-Regulating Control for Resistance Welders

plus or minus two per cent under the same conditions which would cause the unregulated welding current to vary plus or minus 20 per cent.

The G-E Current-Regulating Compensator consists of an electronic control circuit which automatically retards or advances the firing point of the ignitron tubes used to control the welding current, thus holding the current constant regardless of line voltage changes or



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Everything in Machine Vises—from small 3" Drill Press Vise to 9" Heavy Milling Machine Vise including hardened and ground Precision Tool Room and Jig Borer Vises, Plain, Swivel and Angle Vises in various sizes—Quick-Acting Cam Lock Vises for production purposes.

All are of modern design and made for rugged wear and accuracy.

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THE PRODUCTO MACHINE COMPANY

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MODEL No. 1 For 1½" 8-thread spindle lathes — with ⅞" collet capacity — is unsurpassed as a combination chuck for either first or second operation work.

MODEL No. 2 For 1½" 8-thread spindle lathes — with ⅞" collet capacity — full circular low pressure cam activates the collet closing mechanism, thus giving any desired gripping pressure.

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Allison COLLET CHUCKS

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TOOL HOLDER

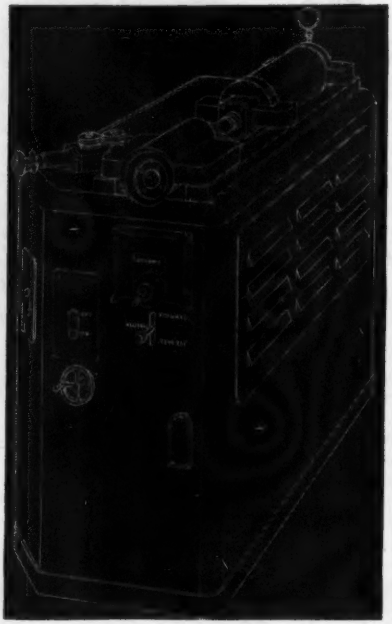
What makes a really fine tool? Proper design and construction, of course, as well as quality of material and workmanship, plus the maker's integrity. JKS Diamond Tools are designed to meet all production problems, but it frequently happens that special conditions call for special treatment. In such cases we make a study of these conditions, preparing a JKS Diamond Tool that will stand up to the most exacting tests. You may add our experience and facilities to your organization by telephoning our nearest district office. This will bring prompt response and wholehearted coöperation.



welding conditions. Housed in a sturdy steel enclosure, the compensator can be readily mounted on or near the welding machine. A desirable feature of the compensator is that it can be applied to most General Electric resistance welding controls which incorporate the phase-shift method of heat control.

Moslo Combination Unit for Extrusion Work

Designed to facilitate laboratory and experimental work in a wide range of extrusion processes, an unusual combination unit is announced by the Moslo Machinery Co., 2443 Prospect, Cleveland, Ohio. The new design combines a lab-



Moslo Combination Unit for Extrusion Work

oratory type 12-ton hydraulic extrusion press and an automatic wire feed unit in one machine occupying only 2 x 4 feet of floor space. Extreme simplicity of operation and convenience of control are outstanding features claimed for the unit, which is of welded steel construction throughout.

While designed primarily for the ex



With This Ring I Thee Wed*

While there is no record of an Abrasive Company Grinding Wheel being used as a Wedding Ring in the above manner, Abrasive Company Service Engineers do recognize the paramount importance of the ideal WEDDING of the grinding wheel—with the work it is to do. ★ Grinding wheel users are invited to bring their grinding problems to "Abrasive." It is then our job to see that the grinding wheel recommended is ideally suited—and therefore, "perfectly matched" with the work it must perform. ★ Only in this way can the result be a "Happy Ending" for all concerned. With Abrasive Company Grinding Wheels, this happy ending embraces UNRIVALLED UNIFORMITY, UNMATCHED PERFORMANCE, and UNUSUAL ECONOMY. May we propose that you let "Abrasive" products convince you right in your own plant, shop or toolroom? Your inquiry will receive prompt and friendly attention.

* *On the Isle of Man great stone rings several feet in diameter have been used as wedding rings. As part of the legal wedding ceremony the bride and groom shook hands through the large hole in the middle.*

TRADE ABRASIVE MARK REGISTERED

COMMANDING QUALITY . . . OUTSTANDING RESULTS

ABRASIVE COMPANY

DIVISION OF SIMONDS SAW AND STEEL CO.

TACONY & FRALEY STS., PHILADELPHIA, PA. • DISTRIBUTORS IN ALL PRINCIPAL CITIES

trusion of welding rods, the Moslo Combination Unit may be obtained with dies for extruding powdered metals, carbon, and certain plastics. The construction of the unit is such that the press may be supplied without the wire feeding unit.

The oil cylinder of the press is provided with an unusually wide range of speeds. Pressures up to 10,000 lb. per square inch on materials is obtainable, a feature which, combined with the automatic wire feeding, makes the unit suitable for small scale production of welding electrodes. A separate cylinder is used for slugging so that slugs can be preformed in quantity if desired. The extrusion die head is constructed at a 45-deg angle. Deflection in the wire guide is said to be minimized by this design due to the fact that the flux is forced in a direction more in line with the wire guide.

The Moslo Combination Unit is supplied complete, ready for connecting to a power line. Hydraulic and electrical controls are located in a panel at the operating end, with a pressure gage, reading in direct pressure, located on the extrusion cylinder where it is in constant view of the operator.

Attachments for Wickman No. 2 Swiss Type Automatic

A set of attachments which is said to increase the range of work that can be handled on the Wickman No. 2 Swiss Type Automatic is announced by The Wickman Corp., 15533 Woodrow Wilson Ave., Detroit 3, Mich. Five attachments are included in the group; namely, a three-spindle attachment for multiple operations and separate attachments for high speed drilling, threading, slotting, and taper pin turning.

The Wickman Three-Spindle Attachment, shown mounted on the machine, may be used for centering, drilling, reaming, threading, or tapping. Indexing is controlled by two plate type cams, and feeds are controlled by a sleeve type cam. The No. 1 spindle is nonrotating and is used for centering and drilling. The No. 2 spindle may either rotate in the opposite direction from the machine spindle or be held stationary. It is used for drilling and reaming operations. The No. 3 spindle overruns the machine spindle for precision threading, but, it can also be held stationary and used for drilling or reaming. The three spindles can be used in any order, one at a time.

WILLEY'S

GENERAL PURPOSE TUNGSTEN CARBIDE TOOLS



Willey's General Purpose Tungsten Carbide Tools, suitable for machining cast iron, tough hard rubber, fibre, bakelite and tough alloy steels. They are low in price, and give increased production with lower costs. Prompt deliveries on these standard tools.

New, Willey's 710

This new, steel cutting grade of Carbide, just announced for cutting tough alloy steels can be used to tip any of the tools shown in Willey's Catalog — or for making special tools to your specifications.

Write for Catalog and Bulletin 144.

WILLEY'S CARBIDE TOOL CO.

SOLE MAKERS OF WILLEY'S METAL

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CUTTING SCREW THREADS?

Keep Those Geometric Chasers 100% Efficient!

Meet today's demands for accurate, smooth threads on tough materials.

The No. 20 Geometric Chaser Grinder below will help you do it. Simple, compact and easy to operate. Designed for only one purpose—the accurate resharpening of chasers —both on the chamfer and on the cutting face.

Geometric chasers are accurately made to produce precision threads. Keep them cutting accurately and on the job longer by resharpening them uniformly and accurately as soon as they show dullness.

It's a wartime duty — and an economy for you.

Several types of fixtures can be furnished for use on this grinder.

Write for our catalogue.

No. 20 Geometric Chaser Grinder



ARMY E NAVY

The Geometric Tool Company

New Haven 15, Conn.

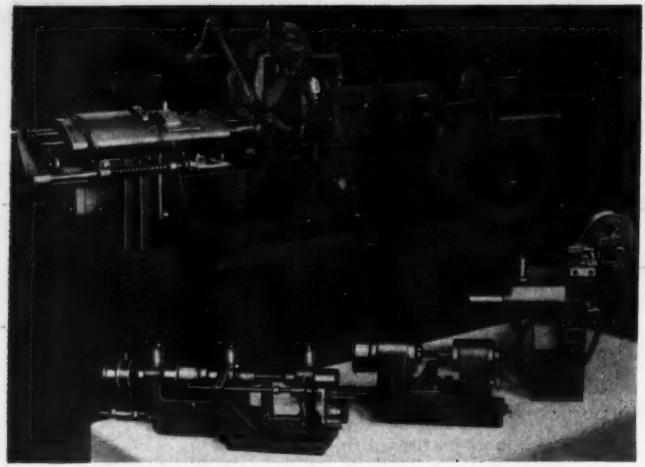


Illustration showing Wickman No. 2 Swiss Type Automatic Equipped with three-spindle attachment. Attachments for threading, high speed drilling, and slotting are shown in foreground.

The Wickman High Speed Drilling Attachment, center, may be used for drilling and centering operations. It consists of a sliding head rotating in the opposite direction from the machine spindle. Feed is controlled by a drum type cam.

The Wickman Threading Attachment, at the left of the illustration, is used to perform precision threading operations with self-opening die heads. It consists of a hollow spindle with a sliding head that over-runs the machine spindle. Over-running the machine spindle in this manner is said to allow for the production of a thread of maximum accuracy and fine finish without slowing the machine spindle. Coolant is supplied to the die head through the hollow spindle of the machine.

Spartan

SPARTAN KUTALL

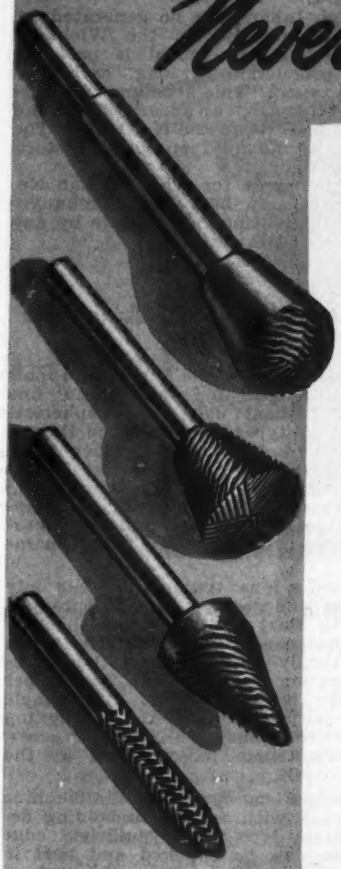
FOR SMOOTH CUTTING AND LONG LIFE . . . .

For Superior Cutting Service, Spartan offers KUTALL Molybdenum High Speed, High Speed Steel, Flexoid, All Hard and Flexible Hack Saws.

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SPARTAN SAW WORKS, INC., SPRINGFIELD, MASS.

Never touched me!



Here's a long-shanked RFC HAND-CUT ROTARY FILE that gets right to the bottom of a deep recess ... cleans it thoroughly ... yet removes no material whatever from the side walls.

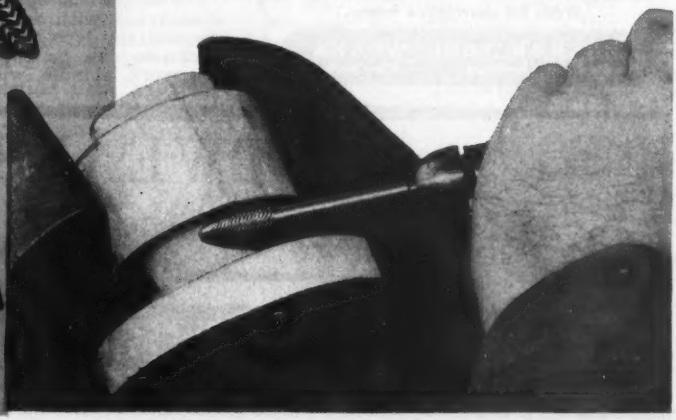
You may have no job for this particular shape—but the chances are that somewhere in your work of cleaning castings or welds or dies ... or in any one of a dozen smooth-finishing operations ... RFC rotary files can speed up your production and do a precision job for you that may open your eyes.

•

THE NEW RFC CATALOG will help you get acquainted with the whole line of RFC standard and special shapes. A range of sizes ... in high speed steel or high carbon steel. You will learn, too, about our special service.

The ROTARY FILE COMPANY

STRATFORD, CONN.



RFC

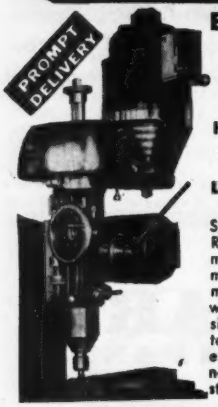
THE SPEED-UP CLEAN-UP TOOL OF PRECISION

The Wickman Slotting Attachment, to the right in the illustration, is used to slot or mill the end of any part produced on the Wickman No. 2 Automatic. A pickup arm reaches down and grasps the part as it is being cut off. The part is then carried to the slotting saw where it is slotted and automatically ejected into the work tray. The pickup arm is positively locked in position during the slotting operation. The movement of the pickup arm is controlled by two cams. The No. 3 toolslide must be removed from the machine when using this attachment, however, it can be used simultaneously with any other Wickman attachment.

Although tapers can be generated by the regular method on the Wickman Automatic, an attachment is provided for the production of long, extremely accurate tapers. This attachment transfers the taper from an accurately ground form bar directly to the No. 1 tool. The form bar is mounted on the headstock of the machine.

All attachments for the Wickman No. 2 Automatic can be used interchangeably, changes being easily made by any set-up man, it is claimed.

MILLING - DRILLING - BORING ATTACHMENT for Heavy Duty Operations



EASY MOUNTING

LARGE QUILL— 4" TRAVEL

(counter balanced, hardened, and ground)

6 SPEEDS, 250-3000 RPM.

Lever and Worm Feeds

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Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes ⅛" to ¾" end mills. Precision Engineered and Ruggedly Constructed Throughout.

Write for descriptive folder.

RUSNOK TOOL WORKS
4840 North Avenue, Chicago, Ill.

Barnes Model No. 4 Automatic Grinder

Incorporating the use of diamond tools of suitable grit for rough and fine grinding optical flats and spherical lenses of all types and radii, the Barnes Model No. 4 Automatic Grinder illustrated herewith, product of the Optical Division of W. F. & John Barnes Co., 301 S. Water St., Rockford, Ill., is equipped with a special hydraulically actuated system for automatic cycle operation.

To grind a lens, the operator has only to insert the lens in holder, press a button to start the cycle, and then remove the lens when the machine has automatically shut off after the grinding operation is completed. The proper curvature is obtained by two simple angular adjustments of the sturdy top spindle arm, plus a differential screw micro-adjustment incorporated in the spindle itself.

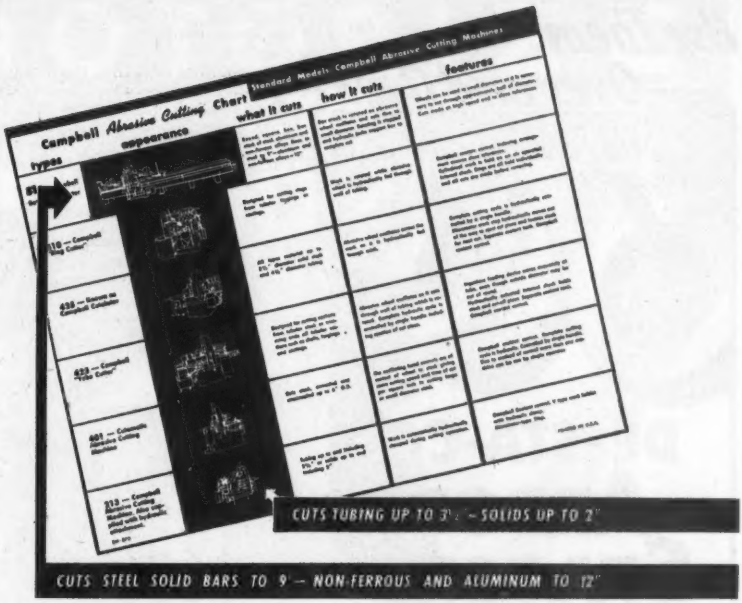
For single lens operation, the machine is equipped with a vacuum holding device whereby lens having sufficient edge thickness can be chucked and held in the work spindle without the use of

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20 years ARGUTO without a drink—

ARGUTO OILLESS BEARING CO.

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Ask a Campbell Engineer to suggest cutting procedure and figure costs for your cutting . . .

CAMPBELL manufactures a complete range—in fact, the *only* complete range—of machines for abrasive cutting. 8 types, 19 models and countless variations developed to meet the jobs of cutting steels, annealed and unannealed; non-ferrous metals, plastics, glass and ceramics—solid bar, tubular and flat stock.

One corporation alone has found **CAMPBELLS** so efficient that they now use 120 **CAMPBELL CUTTING MACHINES.**

There is no reason why you should not call on this wide experience of **CAMPBELLS** and ask them what cutting procedure they would recommend for your plant—what the cost per piece would be. It doesn't put you under any obligation to do this but be sure to state materials you cut, shapes, lengths before cutting, lengths of cut-off pieces and production desired per hour.

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DE-STA-CO ARBOR SPACERS

Measured by the number of times De-Sta-Co Spacers can be used, they are the lowest in cost of any spacers you can buy.

Made of metal, they are not affected by oil or heat.

Use for quick set-up of milling machine cutters and wherever low cost, accurate spacing is needed. Stock sizes .001″ to .125″ thick. Specials, any length, cut from bar stock, ground to decimal.

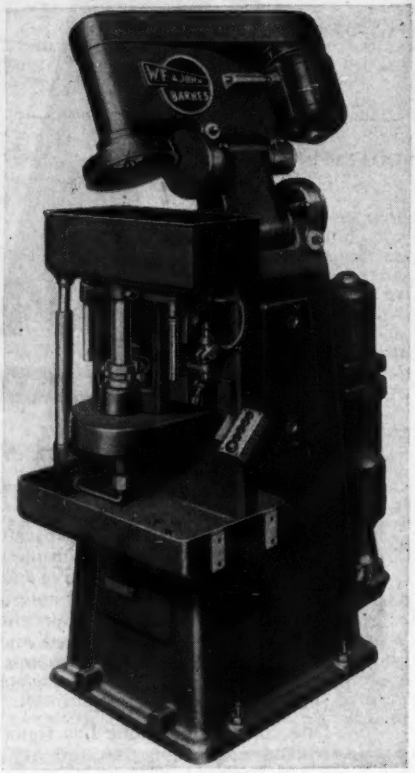
TRIAL ASSORTMENT—enough for average use on one machine sent for $1.00. Give arbor size.

Size and price list sent FREE!

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Established Over 25 Years
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blocking pitch. Lens can be inserted in and removed from the device in a minimum of time.

According to the manufacturer, service on machine spindles is reduced to a minimum by the use of large heavy duty spindles with bronze bearings. The upper spindle has a forced feed lubrication system to provide positive lubrication for speeds up to 6,000 revolutions per minute.



Barnes Model No. 4 Automatic Grinder

The base of the machine incorporates a coolant tank, as well as a removable baffle tray in which ground glass is accumulated and from which it may be easily removed.

Safety features of the Barnes Model No. 4 Automatic Grinder include an emergency return button for returning lower spindle to start position, if desired. A master button for stopping all

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For unit motorization of Machine Tools, you can select no better drive equipment than that made by LIMA.

These units are built in sizes from 1 to 25 hp, to meet the users every requirment of selective speed drive equipment.

Our satisfied customers are proof that LIMA Gearshift Drives do their jobs *Faster* and with *Greater Precision and Safety*

Wire or write today for address of Lima Engineering Service nearest you. Let our Engineers show you how LIMA can serve in *your* plant.

Large enough to successfully serve you, yet small enough to give personal attention to your needs.



THE LIMA ELECTRIC MOTOR CO.

180 FINDLAY ROAD

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LIMA MAGNETIC POLISHING LATHES - LIMA PEDESTAL GRINDERS

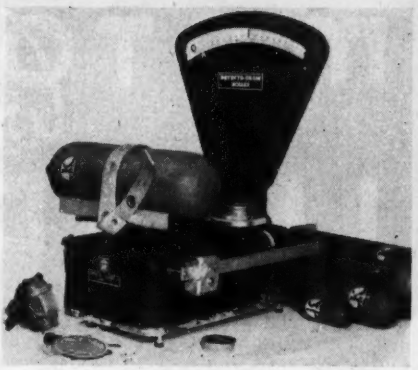


motors is also provided. For set-up purposes, the machine is equipped with a jog button.

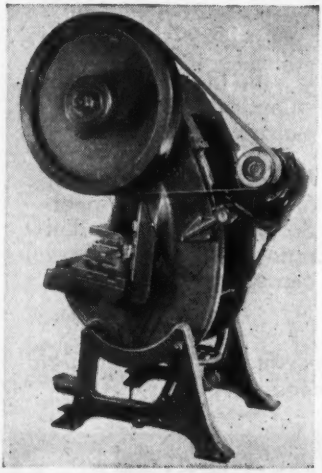
Specifications of the machine are as follows: maximum capacity, 8-inch diameter lens; diameter of lower (work) spindle, 1.875 inches; speed of lower spindle, 200 to 600 r.p.m.; lower spindle motor, 1/3 h.p., 740 r.p.m., 220/440 volt, 3 phase, 60 cycle, a.c.; diameter of upper (tool) spindle, 2.125 inches; speeds of upper spindle, 2,000, 3,000, 4,000, 5,000, and 6,000 r.p.m.; upper spindle motor, ¾ h.p., 3,600 r.p.m., 220/440 volt, 60 cycle, 3 phase, a.c.; minimum stroke of hydraulic unit, 3 inches; maximum stroke of hydraulic unit, 5 inches; motor of hydraulic unit, 1/3 h.p., 1,200 r.p.m., 220/440 volt, 60 cycle, 3 phase, a.c.; flow of coolant pump, 25 g.p.m.; motor of coolant pump, ¼ h.p., 220/440 volt, 3 phase, 60 cycle, a.c.; dimensions of machine, 70 inches high x 24 inches wide x 33 inches deep; loading height, 48 inches.

Detecto-Gram Industrial Fan Scale

An industrial fan scale to be known as the Detecto-Gram has been added to the line of weighing equipment manufactured by Detecto Scales, Inc., 1 Main St., Brooklyn 1, N. Y. The scale is constructed with the reading dial at one end of the base, commodity holder at the other end, and weight plate in the middle. As a result of this type of construction, the three vital points concerned with the weighing operation are in a direct line of vision with the operator,



Detecto-Gram Industrial Fan Scale



SPEED punching and SAVE belting with MASTERDRIVE

How it speeds — High torque, high slip motors pick up the load with minimum shock. No slipping. Gear head motor reduces output shaft speed, permitting a large motor pulley and a high percentage of belt wrap.

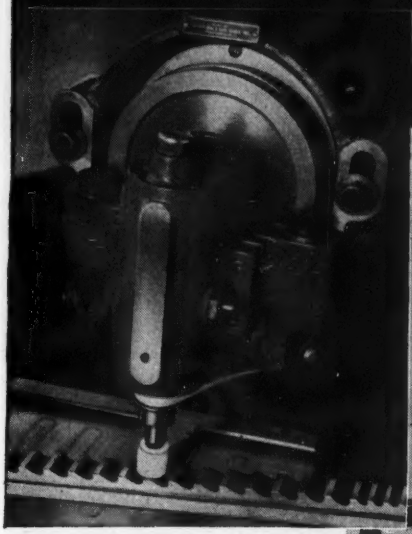
How it saves — Use your present belting. Save rubber, and expense and delay of grooving pulleys. Belt failure will not capsize drive.

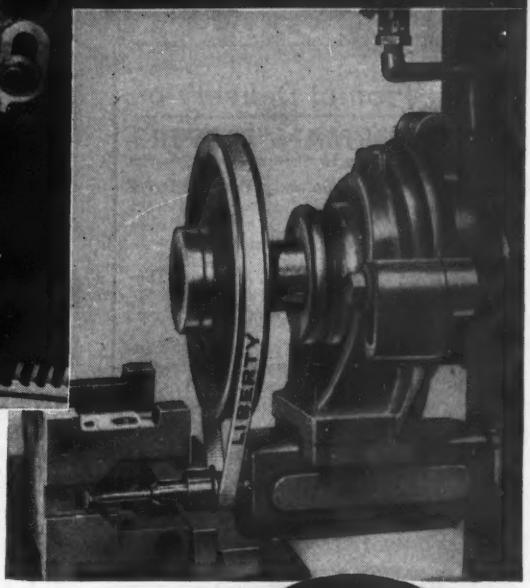
Drive easily mounted above or behind press. No interference with roll feed. Does not obstruct die removal through back of press. A single complete installation with Master Gear Head Motor — one responsibility. Write for details today!

THE MASTER ELECTRIC CO.
INDUSTRIAL EQUIPMENT DIVISION · DAYTON, OHIO

Grinding Those Difficult Jobs with

Liberty High Speed Grinding Attachments

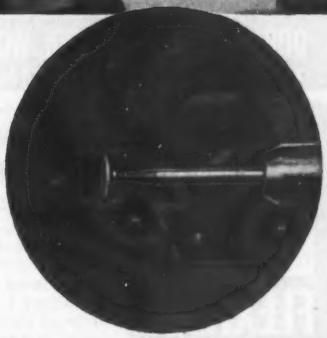




ABOVE
No. 90-31 Vertical, sharpening broach with 5° clearance.

AT RIGHT
No. 90-30 Horizontal, grinding a difficult keyway in a hard-to-get-at place.

Surface Grinders Do Double Duty



Liberty High Speed Grinding Attachments for surface grinders are precision tooled for greater accuracy on intricate and had-to-get-at precision grinding jobs.

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Tomorrow's Tools for Today's Tasks

thus providing for quick and accurate weighing.

The Detecto-Gram Industrial Fan Scale is available with one or two beams, or without beams for direct weighing purposes where weights are employed. The tare beam, which is used to account for the weight of the empty container, is fitted with a small adjustment ball which allows for adjustment of the slightest fraction of an ounce. The scale can be furnished with a choice of five standard dials from a 1-lb. by 1/100-lb dial to a 1,000-gram by 5-gram dial.

The Detecto-Gram Industrial Fan Scale is made in capacities up to 35 lb.



Prompt Delivery on

DORMAN TAPPERS

Adjustable Friction Drive No. 1 Tapper drives from 2-56 tap to ⅜" tap in steel or any other material.

No. 2 Positive Tapper drives from ⅜" to ¾".

No. 3 Positive Tapper drives from ½" to 1" in steel or any other material.

Simple adjustment changes from light friction to positive drive or any intermediate stage on No. 1 size.

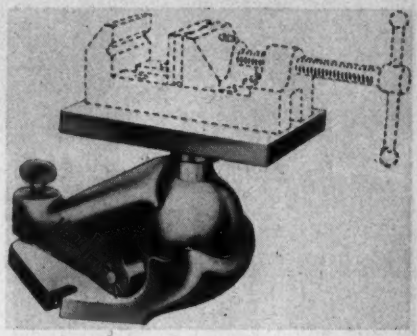
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DORMAN MACHINE TOOL WORKS

337 CANAL ST. • NEW YORK 13, N. Y.

Metro Vise Positioner

Designed for use in performing checking, milling, drilling, shaping, boring, welding, filing, and other operations, the Metro Vise Positioner illustrated herewith is now being offered by the Metro-



Metro Vise Positioner

Vise Co., 274 Stephenson Bldg., Detroit 2, Michigan.

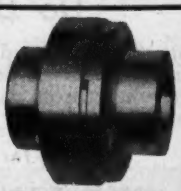
As shown, the construction of the unit includes a faceplate to which vise or fixture can be bolted or otherwise fastened, thus allowing for tilting of clamped work to any desired angle. The positioner operates on the ball and socket principle and can be quickly released or locked in position by an easy turn of a conveniently located thumbscrew. Babbitt jaws provide for smooth adjusting and rigid clamping of faceplate.

The Metro Vise Positioner is available in two standard sizes of 3 and 4 inches. The 3-inch size measures 5¾ inches high, has a 4 x 6-inch table, and weighs 30 lb. The 4-inch size measures 7¼ inches high, has an 8 x 11-inch plate, and weighs 58 pounds.

L-R FLEXIBLE COUPLINGS

DEPENDABLE HELP for OVERLOADED MOTORS

Shock of heavy loads causes many motor troubles. L-R Couplings effectually absorb shock and vibration, corrects misalignment, endwise displacement, adjusts to surge, pulsation, etc. Non-Lubricated.



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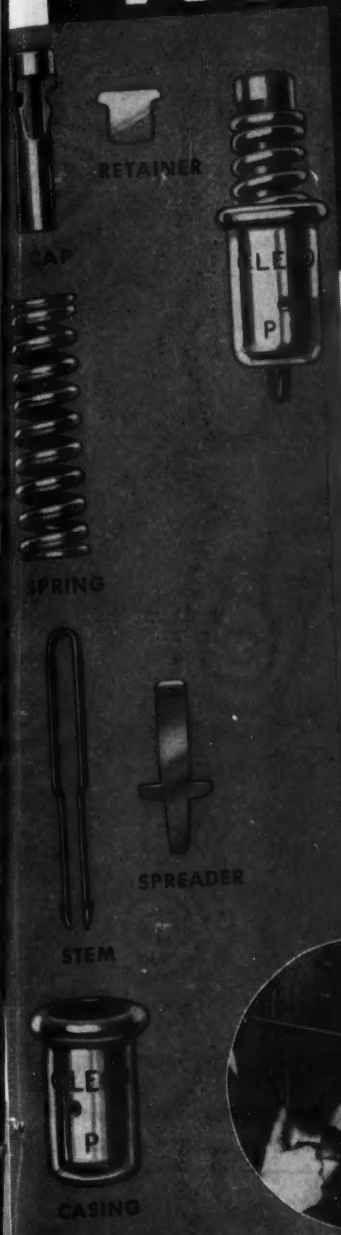
Pat.& Pats. Pend. L-R TYPE "H"

LOVEJOY FLEXIBLE COUPLING CO.

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NOW READY!

CLECO TYPE "P" *Triple-Safe* SHEETHOLDERS



NOW offered by the original American manufacturers of quick fasteners for airplane skin, Type "P" Clecos have the additional advantage that the parts will not "fly" if the stem breaks. Locked at 3 points, they are *triple-safe*. As in previous types, these Clecos are repairable and each size is colored differently for quick identification. They can be handled with any style of pliers used in the past. CLECO pliers, always handy and compact, have now been improved further, and are the best obtainable.

Cleco Type "P" sheetholders can also be furnished with longer stems and spreaders for work requiring that a greater thickness be gripped. Standard unit holds thicknesses from 0" to 3/16". A longer stem and spreader combination holds thicknesses of 3/16" to 3/8". A still longer combination holds thicknesses from 3/8" to 5/16", and so on.

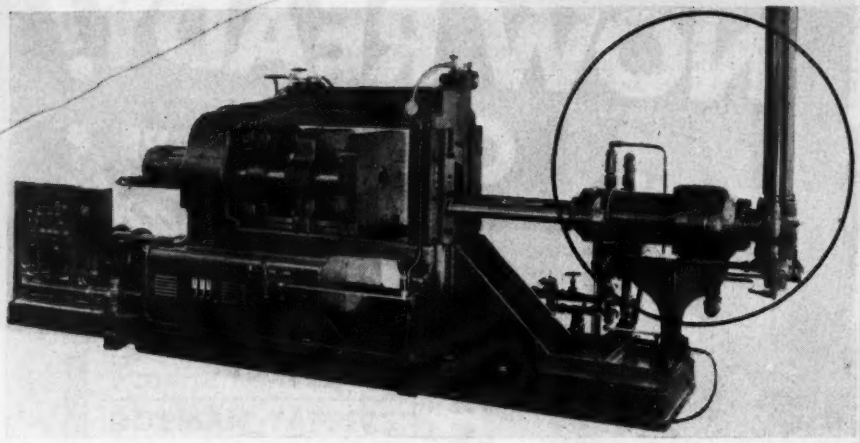
Type "P" sheetholders are available in sizes 3/32", 1/8", and 5/32". Parts are either pentrated (self lubricating) or plated —thoroughly rust-proofed. With required priority, shipment is surprisingly prompt. Send for Type "P" bulletin.

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3781 East 77th Street · Cleveland 5, Ohio
Branch Offices in all Principal Cities

BUY U. S. WAR BONDS AND STAMPS



• Teammate with Cleco sheetholders is the RIV-N-JECTOR, astonishingly simple and effective device for reducing rivet losses 90% in aircraft work. Ask for *new* Bulletin 89.



Lester-Pheonix Die-Casting Machine Equipped with "Pre-Fill" Injection System

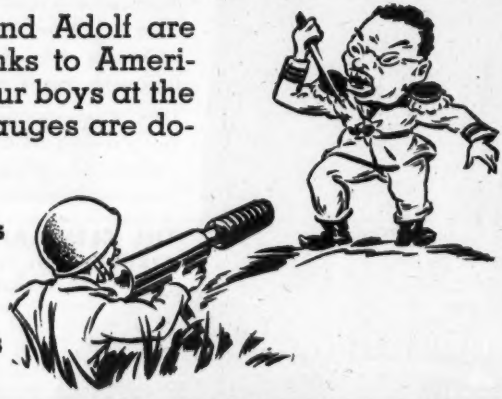
Lester-Phoenix "Pre-Fill" Injection System for Die-Casting Machines

A "pre-fill" injection system which is said to provide for the production of aluminum, brass, and magnesium die castings that are relatively free of porosity and therefore suitable for critical stress loaded applications is announced by Lester-Phoenix, 2711 Church Ave., Cleveland 13, Ohio.

Available as optional equipment for

BETTER DO IT NOW, MR. TOJO!

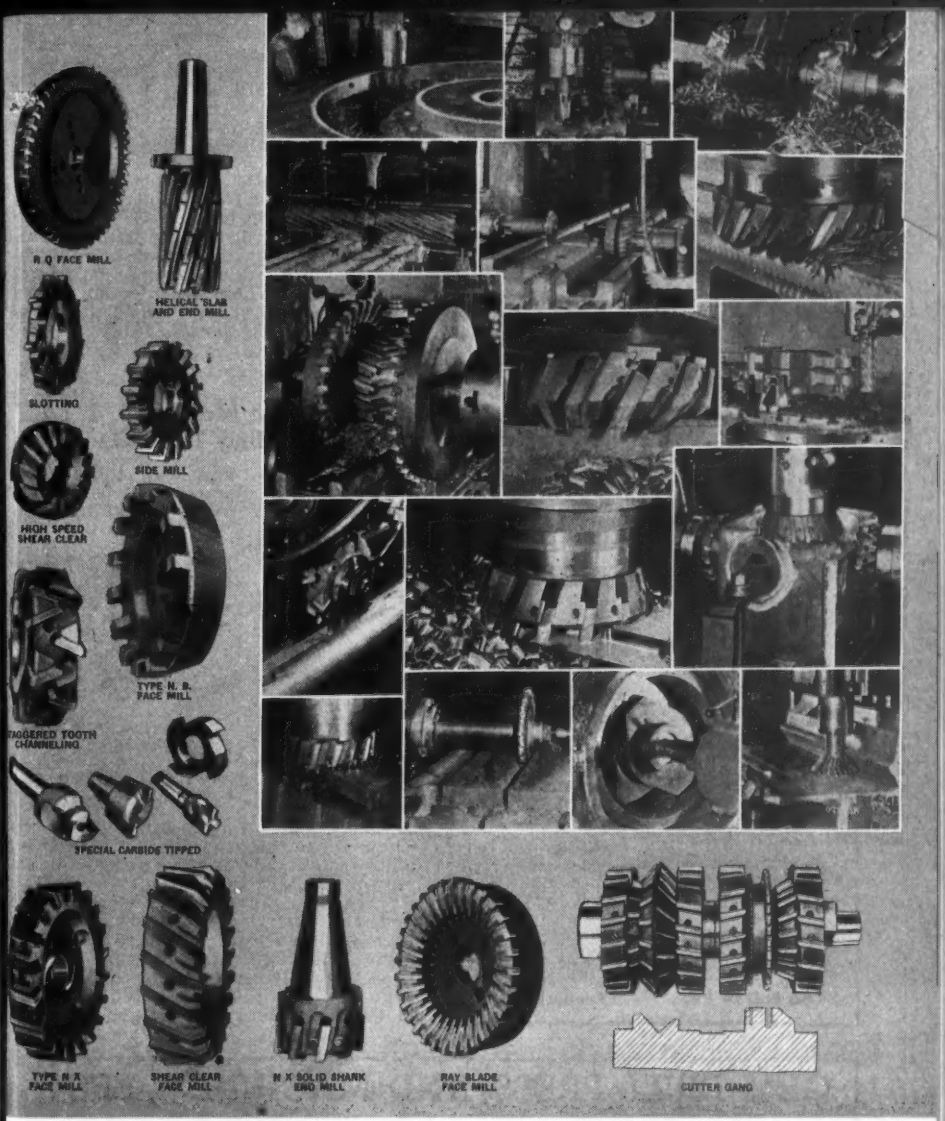
You and your friend Adolf are both doomed, thanks to American industry and our boys at the front . . . Master Gauges are doing their part.



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THREAD RINGS
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PLAIN RINGS
SNAP — PROFILE
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Present Ingersoll cutter designs have developed from over fifty years' experience in making tools for special Ingersoll milling, boring, and drilling machines. In addition to the standard types of inserted blade milling cutters for face milling, side milling, slotting slabbing and end milling, many special types of tools are available. Both types are illustrated above by themselves and at work.

Most of these tools may be furnished with either high speed steel, cast alloy, or carbide tipped blades. We also build solid cutters with brazed carbide tips and negative angle carbide cutters for milling steel.

We will be glad to send you a booklet (Ingersoll Milling Cutter Engineering Specification Sheets) describing our standard inserted blade cutters. Your inquiries concerning special inserted blade tools will also receive prompt attention.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILL.

Lester-Phoenix high-pressure cold-chamber die-casting machines for aluminum, brass, and magnesium alloys, the pre-fill system consists of a hydraulic cylinder fitted with a large actuating piston, the hollow piston rod of which contains a passageway to a smaller inner fixed piston. Oil under 1,000 lb. per square inch hydraulic pressure is introduced through the hollow piston rod, displacing at high velocity the small piston opposing it, which piston also carries with it in its forward movement the piston rod and the attached main or large piston.

As the latter moves forward at high speed, oil flows by gravity from a vertical storage tank through the pre-fill check valve to occupy the space back of the large piston. When the die cavities have been filled, an oil pressure of 2,000 lb. square inch from a booster pump is applied directly to both pistons, resulting in high sustained final injection pressure which packs the metal into the die. When the injection piston reverses, the oil is returned to the gravity tank and oil pump, ready for the next cycle.

Automatic Metal Saw Grinder and Retoother

MODEL IC



PRECISION and ACCURACY AUTOMATICALLY ASSURED

For metal cutting saws 2" to 14" in dia. When specified, saws as small as ¾" dia. and ¼" to 2" spacing. Also supplied as a Combination Grinder for circular, band and hack saws.

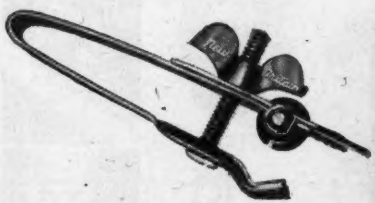
WRITE FOR CIRCULAR

The Wardwell Mfg. Co.

3166 Fulton Rd. Cleveland, Ohio

New Britain Model No. T 120 Self-Feeding Tube Cutter

Copper, brass, and lead tubes from ⅛ to ⅝ inch in diameter can be quickly and precisely cut by means of the New

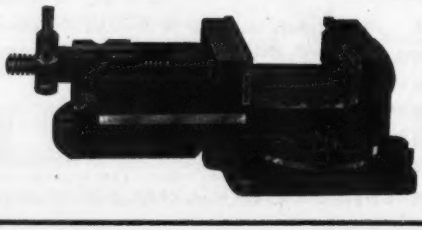


New Britain Self-Feeding Tube Cutter

Britain Model No. T 120 Self-Feeding Tube Cutter shown herewith, product of the New Britain Machine Co., New Britain, Connecticut.

After a tube is inserted in the cutter and the latter properly tightened, it does not have to be reset. The tension in the frame automatically provides for a deeper cut upon each turn of the tube until the tube is severed. The tool is 4½ inches long and weighs 3 ounces.

GEM DRILL PRESS AND MACHINE VISES...



Modern Vises for Tool-room and Production. Sizes ranging from 3" to 10¼" opening. Strong, Versatile, Quick-Acting. Pay for themselves in time-saving.

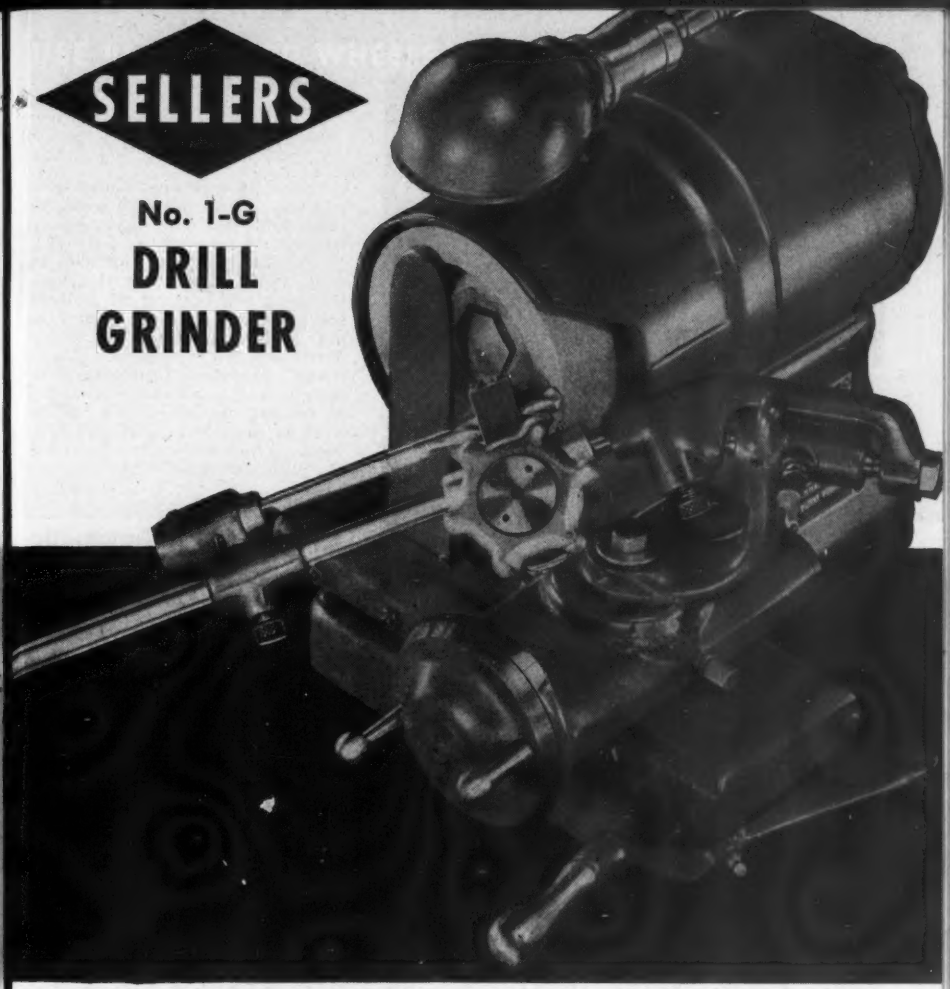
Write for circular describing entire line of GEM MACHINE VISES.

J. E. MARTIN MACHINE WORKS

548 State St. Springfield, Ohio

SELLERS

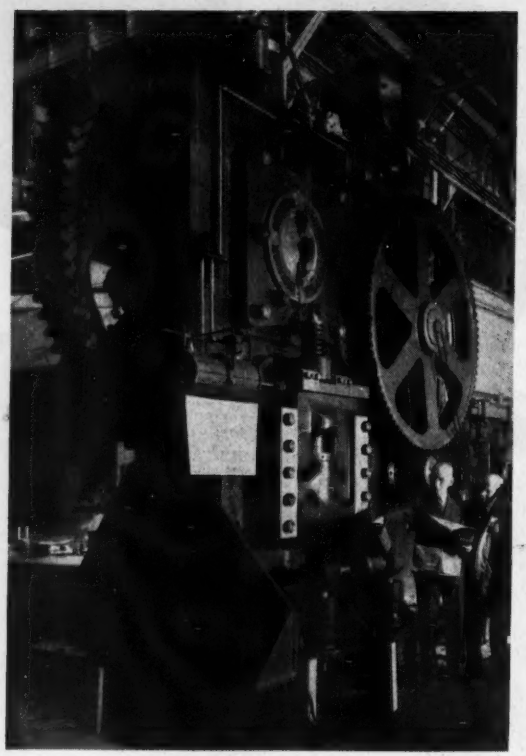
No. 1-G
DRILL
GRINDER



Every SELLERS Drill Point is Scientifically Correct

And it takes but a few hours for a green-horn to become an expert on this modern machine shop tool. Once set for the angle and clearance you require, it automatically produces a steady flow of perfectly pointed drills—each exactly like the other. Speeds drilling time: reduces drilling costs: reclaims broken drills. Type 1-G takes drills from .028" (#70) up to ½" dia. Other models have capacities up to 3" dia. *Write today for complete data and prices.*

WM. SELLERS & COMPANY • **1614 Hamilton St., Philadelphia**



"Buffalo" No. 17 Billet Shear

Accelerated production of forged steel parts is said to be effected through the use of the "Buffalo" No. 17 Billet Shear illustrated herewith, product of the Buffalo Forge Co., 388 Broadway, Buffalo, N. Y. Believed to be the largest machine of its type ever constructed, the shear weighs over 80 tons and has an electrically-welded "armor-plate" frame.

Pressure on the knives is 4,500,000 lb., adapting the machine to the cutting of 10-inch steel bars at a rate of six cuts per minute. Clutch and hold-down are air operated. Automatic pressure lubrication is provided by a lubricator mounted on the machine. The entire unit is operated by a 125 h.p. motor which drives the flywheel through multiple V-belts.

Onsrud A80-A Automatic Contour Miller

The Onsrud A80-A Automatic Contour Miller shown herewith, product of the Onsrud Machine Works, Inc., 3924 Palmer St., Chicago 47, Ill., employs eight cutter heads, mounted on two carriages, for automatically milling long, nonferrous aircraft parts, such as spar channel beams and cap strips. Each carriage is designed to accommodate two vertical and two horizontal cutters, and all eight cutters may be used at one time if the nature of the work requires.

The carriages ride on the bed of the machine, and the work is held to the table by air-operated clamps which allow for quick loading and unloading. Carriage speeds range from 4 inches to 18 feet 6 inches per minute, thus permitting exact selection of cutter feed to

Produce with **SAFETY!**

It pays to protect your operators by equipping your punch presses with

STRAND Enclosure Safguards

Easily installed. Adjustable to any size die. Quickly changed for any set-up. *Write for circular.*

STRAND MFG. CO., INC.

SAFETY ENGINEERS

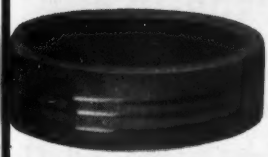
156 N. Desplaines St. Chicago 6, Ill.



USE BLANCHARD WHEELS ON BLANCHARD GRINDERS



MATERIAL
Nickel Cast Iron
WHEEL
220C10
FINISH
6 Micro inches
LIMITS
Flat
PRODUCTION
one every 5 minutes (one side) removing .010 inches stock



ANCHARD CYLINDER WHEEL

Clutch Pressure Plate Ground on No. 11 Blanchard Surface Grinder

Blanchard has made rapid strides in securing fine finishes from Blanchard Grinding Wheels. Finishes as fine as 1½ micro inches are obtained when Blanchard Wheels are used. The finish produced on cast iron is so fine, wheel marks disappear bringing out the grain in the iron. Parts are now being ground that were formerly lapped.

Experience shows that Blanchard Wheels with "C" abrasive in grain sizes of 80 to 220 give best results in producing fine finishes regardless of the kind of material being ground.

For fine finishes on cast iron use wheels — 80C10, 100C10 or 220C10, on hardened steel use wheels — 80C20, 100C20 or 220C10. In a few instances a slight variation from these grades may be necessary depending on the area of the surface to be ground.

For most efficient operation of Blanchard Surface Grinders specify Blanchard Wheels.

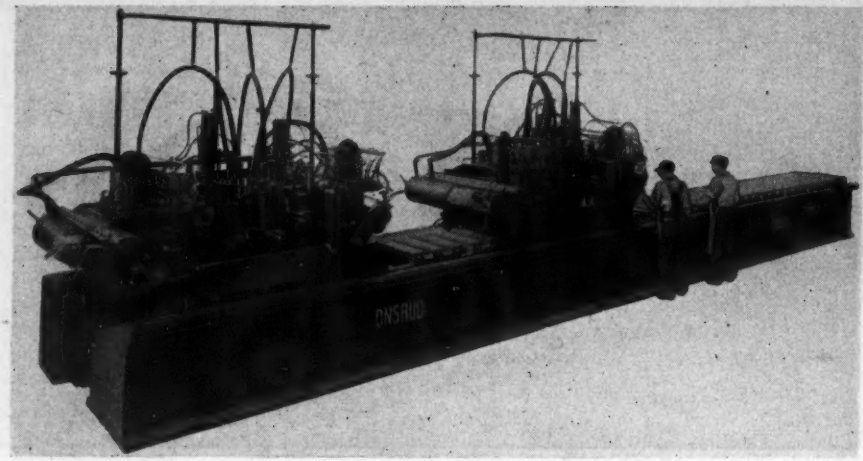
BLANCHARD

The Booklet "Blanchard Wheels" contains helpful information on the selection of grinding wheels for all kinds of work — sent free on request.



The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASSACHUSETTS



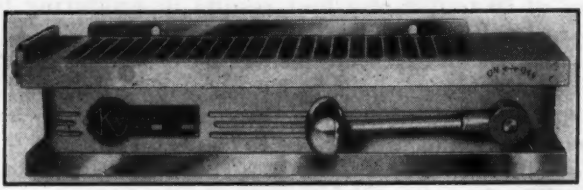
Onsrud A80-A Automatic Contour Miller

suit the work being done.

Cutter motor speeds of the A80-A range as high as 10,800 r.p.m., providing lineal cutter velocities of from 5,000 to 8,000 feet per minute. The eight cutter motors are rated at 180 h.p. normal and are said to be capable of 100 per cent overload due to a special water cooling system.

Cutter travel is controlled by a tem-

KAR Permanent Magnet CHUCKS



Cannot Fail
Hold Work Tight
Generate No Heat

An outstanding and exclusive advantage of the KAR Permanent Magnet Chuck is its ability to hold smaller pieces securely due to the close spacing of the pole pieces.

Release Easily
Used Wet or Dry
Use No Power

THE KAR ENGINEERING CO., Inc.
GREAT BARRINGTON MASSACHUSETTS

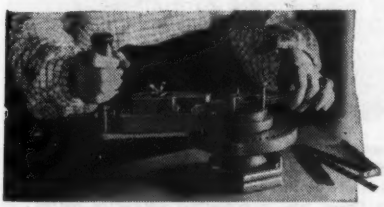
Talk About PRODUCTION Without DIES!

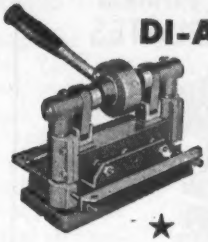


4,000 PARTS per DAY with DI-ACRO Bender

"Enclosed pictures in our plant prove the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on Request.)

Here is an example of "DIE-LESS DUPLICATING" typical of a great variety of formed parts readily made with DI-ACRO Precision Machines, — Benders, Brakes, Shears. Picture below shows the DI-ACRO Bender making an acute right angle bend and photograph above shows the finished part formed to die precision. Women operating DI-ACRO units maintain a high out-put on production work.





DI-ACRO Shear

Squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. 3 sizes. Shearing widths, 6", 9", 12".



DI-ACRO Brake

Forms non-stock angles, channels or "Vees". Right or left hand operation. 3 sizes. Folding widths, 6", 12", 18".

Send for Catalog

showing DI-ACRO Precision Machines and many examples of parts made with "DIE-LESS DUPLICATING".



O'NEIL-IRWIN MFG. CO.

306 EIGHTH AVE. SOUTH • MINNEAPOLIS 15, MINNESOTA

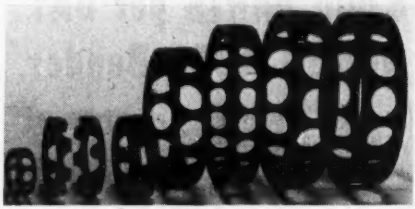
plate contoured so as to provide for the production of the desired shape or contour in the finished work. The cutters, under pneumatic pressure, are guided by template followers. Each cutter and its template follower are part of a single motor assembly and remain in fixed relationship to one another.

Cutter feed is automatically controlled. Rollers moving over a cam bar contoured in relation to the work, exercise rheostat control over carriage drive motors. Thus, the machine slows down during heavy "hogging" cuts and speeds up again as the nature of the work permits. This speed-up extends all the way to "skip" feed between cuts. A G-E Thy-Mo-Trol system is used to convert a.c. to d.c. and so provide the stepless wide range drive of a d.c. motor.

The Onsrud A80-A Automatic Contour Miller is 60 feet long overall, however, the bed may be made still longer, if the nature of the work requires, by adding sections which can be supplied.

Westinghouse Micarta Ball Bearing Retainer Rings

Said to largely overcome limitations of loads and speeds when used for ball bearings of high speed grinders, retainer



Westinghouse Micarta Ball Bearing Retainer Rings

rings made of plastic Micarata are now being offered by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Accurately machined by automatic means, the Micarta retainers are said to possess great mechanical strength and are light in weight. The rings are rigidly made yet stated to be flexible enough to resist vibration and shock. Since Micarta has good wetting qualities, lubricants are said to adhere very well and thus provide for unusually quiet operation with a minimum of wear.

NEAT STAMPING in NAME PLATES



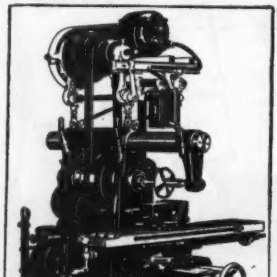
Nameplate Detail Press

This machine quickly stamps details and serial numbers into name plates.

Write for Particulars

GEO. T. SCHMIDT, Inc.

1806 Belle Plaine Ave., Chicago 13, Ill.

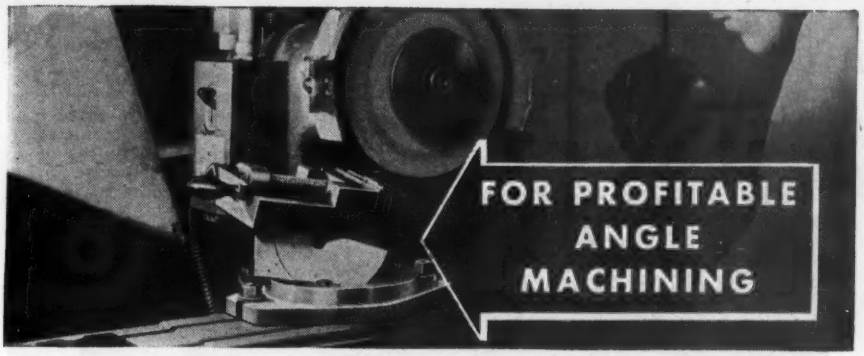


The drive that stays in service.

A "short" in a motor can't "gum up" production from a machine tool equipped with a Remco Drive. Simply unbolt and remove the dead unit and substitute another motor—a matter of minutes. Only the Remco Drive has a patented universal motor mounting which takes any motor of reasonable size—new or USED. Nothing else like it! Write . . . Remco Products Corp., State and Hay Sts., York, Pa.

REMCO MOTOR DRIVE

for LATHES, SHAPERS, DRILLS, MILLING MACHINES, ETC.

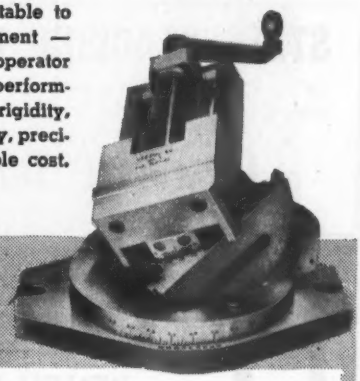


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PRECISION ANGLE GRINDING • MILLING • DRILLING • SHAPING • DIE-SINKING • SAWING • FILING • REAMING • SLOTTING • CHECKING

. . . and many other speedy Angle Set-ups for precision Toolroom or Production Operations. You save many vital hours . . . you cut costs four ways: (1) By speedy angle set-ups — (2) By angle accuracy that reduces spoilage or "rejects" to a minimum — (3) By making your present equipment adaptable to practical angle machining for every requirement — (4) By simplifying angle set-ups so that every operator is capable, with WESSON Universal Vises, of performing precision angle operations fast. Super-rigidity, wide range capacity, compactness, finest quality, precision engineered . . . a BIG value, at reasonable cost. INVEST NOW!

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BUILT TO WESSON STANDARDS OF QUALITY AND PRECISION

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Dept. MM5, 710 Fisher Bldg.
Detroit 2, Michigan

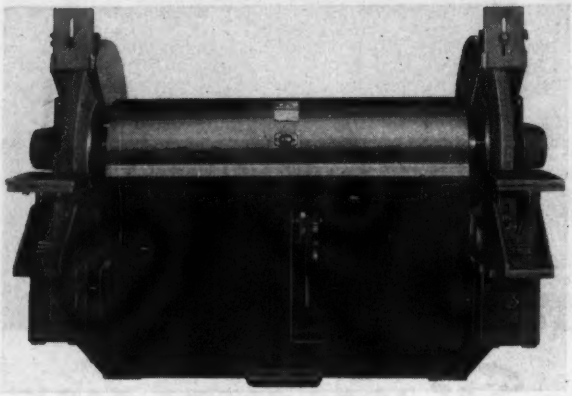
Please send me illustrated bulletin of WESSON Universal VISES and ANGLE PLATES.

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Marschke Vari-Speed Floor Stand Grinder

Marschke Vari-Speed Floor Stand Grinder

A variable speed floor stand grinder for heavy duty snagging, to be known as the Marschke Vari-Speed, has been brought out by the Vonnegut Moulder Corp., 1819 Madison Ave., Indianapolis, Ind. The machine can be equipped with 24 x 4-inch or 30 x 4-inch high speed wheels and 25 to 40 h.p. motors with momentary overload capacities of 50 to 80 horsepower.

Outstanding features of the unit include automatic regulation of variable speed control to assure correct rim speeds and provide for maximum abrasive service; well fitted flanges and heavy steel guards for wheels for maximum operator safety; adjustable, rigidly designed work rests; hinged hood for accessibility to lubrication connections; clean-out doors for wheel guard pockets; convenient operation; durable variable speed pulleys; multi-strand C-section V-belt drive; and three-bearing support for massive alloy steel spindle.

Specifications of the Marschke Vari-Speed Floor Stand Grinder are as follows: horsepower, 20, 25, 30 or 40; size of wheels, 24 x 4 inches or 30 x 4 inches;

STEEL STACKING BOXES *TOP RIM*

18" x 12" x 6" — 16 Ga.
with drop handles..... $1.27



IMMEDIATE SHIPMENT



STANDARD SIZES

18 x 12 x 6 . . . 16 Ga.
18 x 12 x 8 . . . 16 Ga.
16 x 10 x 6 . . . 18 Ga.
16 x 10 x 6 . . . 16 Ga.

MADE IN OTHER SIZES

BENCH LEGS
Four sizes. All Welded.
Olive Green enamel.

BENCH TOPS
Steel and wood with or without drawers.

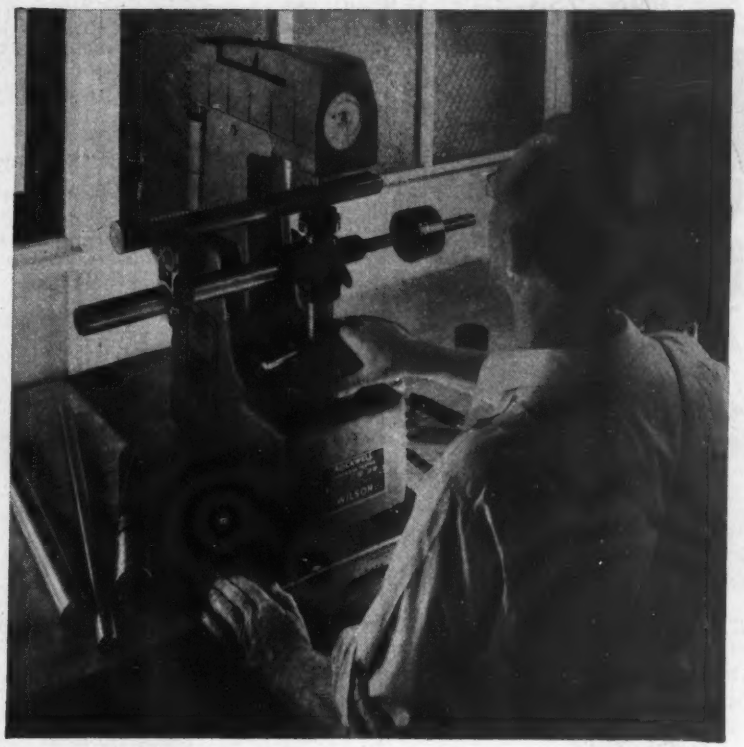
Literature on request.

STERLING
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183 CHARLES ST.
PROVIDENCE, R. I.

"ROCKWELL" HARDNESS TESTER

New J Model — Delivery Immediate.



When pieces are to be tested off center, if they are not extremely long, this Vari-Rest work support, which has many support adjustments, lifts the whole piece in unison when the part is lifted to apply minor load.

Note that dial is completely enclosed. Operator never touches it.

Only WILSON *makes the* "ROCKWELL" *Tester*

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383 Concord Ave., New York 54, N. Y.

CHICAGO STEEL PRESS

No. 253



SPEED WAR PRODUCTION OF SHEET METAL WORK

USE FOR . . .

1. FORMING
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of Ammunition Cases, Bomb Box Liners, Bomb Fins, Aircraft Parts and Many Other Offense Products.

The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials. Sizes 4, 5 and 6 ft. capacities up to 10 gauge.

Write for Circular No. 255

DREIS & KRUMP MFG. Company

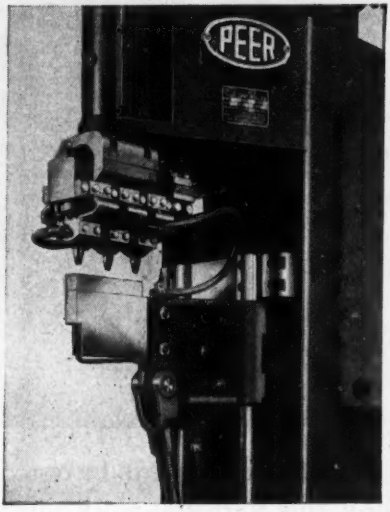
7418 LOOMIS BLVD.

CHICAGO 36 **ILLINOIS**

standard size of wheel hole, 12 inches; size of base, 59 x 43½ inches; overall floor space, 84 x 60 inches; floor to center of spindle, 35 inches; spindle diameter between bearings, 3¾ inches; spindle ends, 2¾ inches; distance between wheels, 64 inches; overall length of spindle, 82⅝ inches; size of work-rest top plate, 9 x 13½ inches; vertical work-rest adjustment, 4 inches; exhaust outlets, 7 inches O.D.; approximate net weight, 4,000 lb.; shipping weight, 5,000 pounds.

Peer Multiple Spot Welding Electrode Units

Especially adaptable for the fabrication of assemblies requiring a number of spot welds within close proximity, a

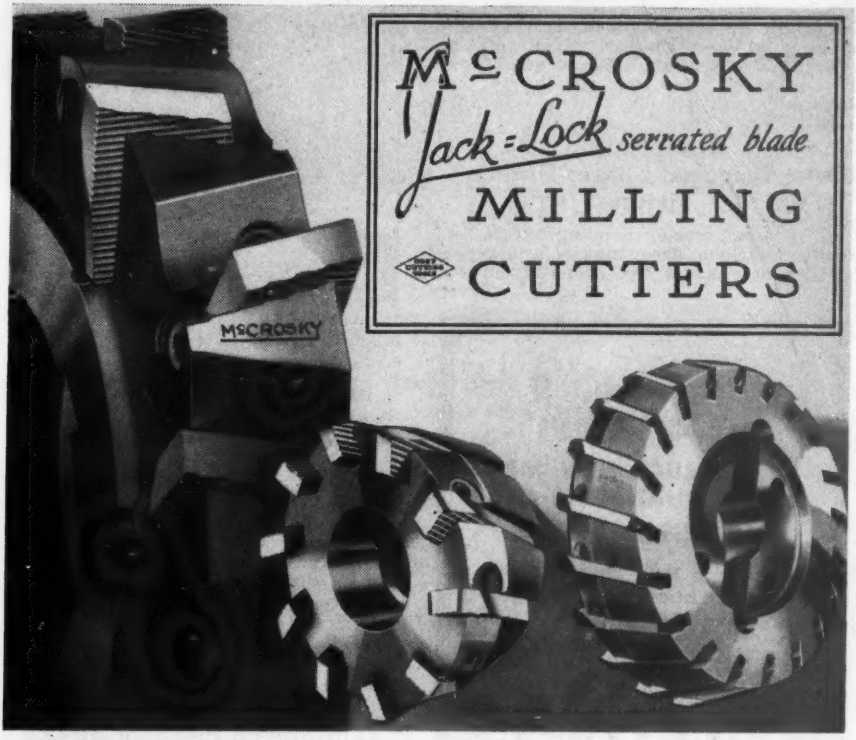


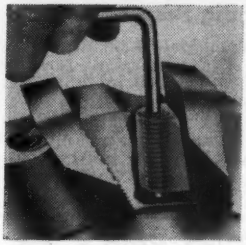
Peer Press Type Welder Equipped with Multiple Spot Welding Electrode Unit

series of hydraulically equalized multiple spot welding electrode units has been added to the line of peer welding equipment offered by the Pier Equipment Mfg. Co., 2000 Milton St., Benton Harbor, Michigan.

The accompanying illustration shows a three-point unit installed on a Peer press type welder. This particular installation is said to provide for a reduction to 14 the number of operations

McCROSKY
Jack-Lock serrated blade
MILLING CUTTERS





McCROSKY'S JACK-LOCK WEDGE, occupying a semi-circular recess in cutter body, forms an independent unit with its fine-pitch setscrew. Tightening of the setscrew lifts the wedge *like a jack*, putting blade serrations into rigid engagement with body serrations. This locks the blades securely, assures rigidity.

McCROSKY'S ADJUSTING SETSCREW behind each blade provides fine, accurately controlled forward adjustment. This holds the amount of blade stock removed in resharpening to a minimum. The independent adjustment permits reclaim of any blades in a set.



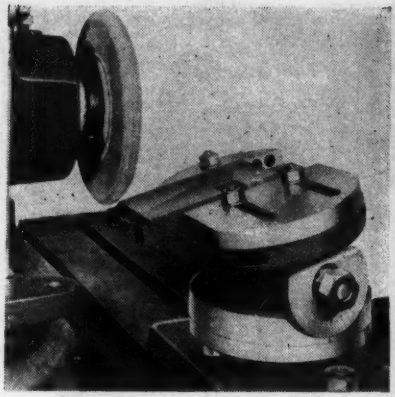
For further information, write for Jack-Lock Bulletin 16-M and the McCrosky Milling Cutter Manual.

McCROSKY TOOL CORPORATION, MEADVILLE, PA.

necessary in welding a metal box requiring 52 spots welds. Accuracy of spacing is said to be easily accomplished and pressures held uniform due to the hydraulic equalization provided in the head.

Oster Universal Chaser Grinding Fixture

A universal chaser grinding fixture for holding various sizes, makes, and types of dies or chasers has been introduced by The Oster Mfg. Co., 2050 E. 61st St., Cleveland, Ohio. The fixture is designed for easy mounting on the table of any conventional tool and cutter grinding machine and is adjustable for any throat or rake angle desired.



Oster Universal Chaser Grinding Fixture

The Oster Universal Chaser Grinding Fixture has an overall size of 5½ x 5½ x 9 inches (unboxed), net weight of 25 lb., and shipping weight of 35 pounds.

Bath Stretch Head for Stretch Forming Presses

A semi-standard stretch head for use in connection with stretch forming presses has been developed by The Cyril Bath Co., E. 70th and Machinery Ave., Cleveland 8, Ohio. The casing of the head is made in various sizes and may be fitted with jaws providing either two, three, or four angular sliding move-



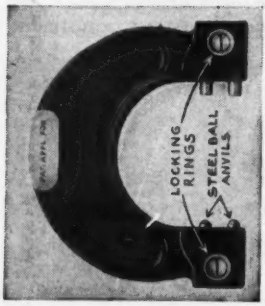
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Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for all Industrial Purposes.



ADJUSTABLE SNAP GAGES IN STOCK Model A

Immediate delivery .025" to 7"

PROMPT DELIVERY ON PLUG GAGES .030" to 8"

Extraordinary Improvement in Adjustable Snap Gages with Ball-tipped anvil and amazing positive locking system cannot get out of set—Pat. Appl'd for.

GOOD GAGES — Prevent Spoilage, Speed-Up Operations — Utilize Less Skilled Help, Reduce Costs

EASTERN PRECISION GAGE CO.
HERSH TOWER BLDG., BROAD ST. ELIZABETH, N. J.
Phone, Elizabeth 2-9519

A secret in "wringing"!



● It is a not too closely guarded secret. The U. S. Bureau of Standards *(see Scientific Papers of the Bureau of Standards, No. 436, Part of Vol. 17, P. 691, "Interference Methods of Standardizing and Testing Precision Gage Blocks")* has stated explicitly that in making accurate calibration of gage blocks, the error introduced by oil or other film should be eliminated.

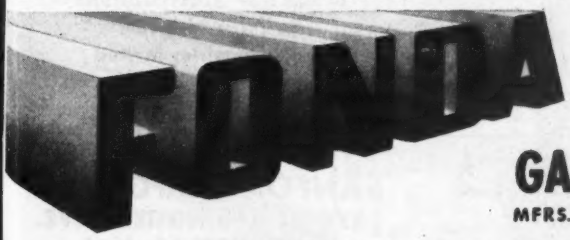
Certainly, it is a demonstrable fact that if such film is used in wringing gage blocks, some impairment will result in the extreme accuracy of measurements made by the blocks and in their wringing qualities.

Write for FONDA'S bulletin, "Precision in Millionths," which tells of the new "ULTRA-FINISH" that makes *the use of oil or other films unnecessary* in wringing FONDA Gage Blocks.

FONDA'S advanced methods in gage block manufacture have made FONDA the choice in many vital plants and laboratories, for critical precision measurement.

PASSED HIGHEST TESTS DEVISED BY NATIONAL BUREAU OF STANDARDS

PROMPT DELIVERIES



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GAGE COMPANY

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175 FIFTH AVENUE, NEW YORK • FACTORY—STAMFORD, CONN.

Agents in all principal cities throughout the World

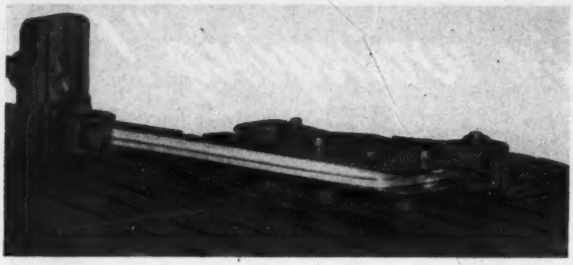


Illustration showing Bath Stretch Heads being used in forming and stretching a tank strap

ments and so arranged as to grip almost any shape evenly and over a maximum amount of surface.

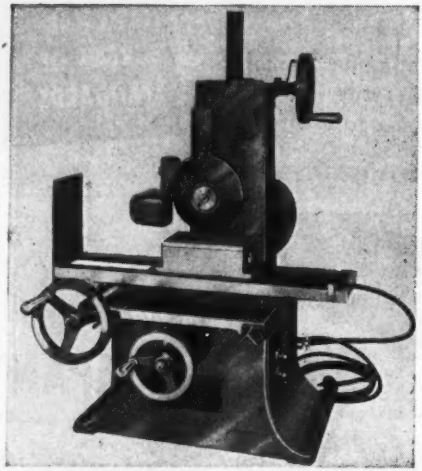
According to the manufacturer, the Bath Stretch Head can be adapted to the pulling of either extruded shapes, brake or rolled sections, or flat sheet work, and has been successfully used with all grades of aluminum alloys and stainless steel. In the smaller size heads, the jaws may be hand released. In the large size heads, either air or hydraulic cylinders provide for the initial clamping and releasing of work.

The accompanying illustration shows a set of stretch heads installed on a Bath universal rotary stretcher for use in forming a tank strap in which the leg of the angle must stay in a horizontal plane while the flange changes in angugularity as much as 15 deg. from one end to the other. The jaws of the heads are so constructed that different inserts can be readily adapted to accommodate different shapes. The jaws are loaded by simply pushing the material in, and unloaded, by pulling the release handle on each head forward and then removing the stock.

Ideal Combination Etcher and Demagnetizer

Availability of a combination etcher and demagnetizer enclosed in an attractive case with removable,, hinged cover is announced by the Ideal Com-

Sanford Precision Bench Surface Grinder



A HIGH SPEED GRINDER FOR ALL SMALL PRECISION WORK

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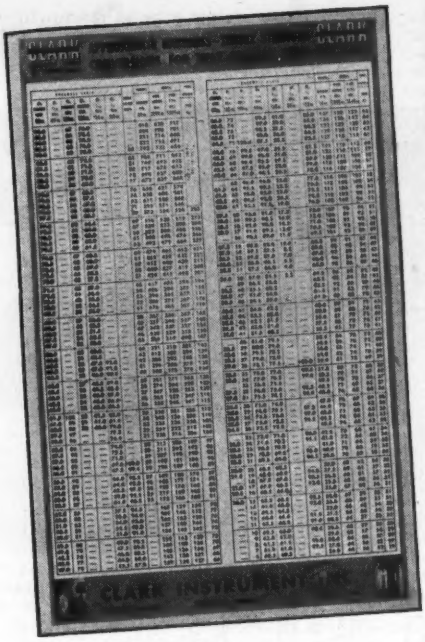
Dealer Inquiries Invited

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If you are a production executive whose responsibility includes the hardness testing of metals, you will certainly want one of these new charts for your office, shop, or laboratory. Handsome in appearance, printed in three colors, with the very minimum of advertising, it will prove its value every hour of every day. Type is large, easily read at a distance of several feet, yet the chart itself is only 24" wide and 32" high—about the size of a calendar.

Although a chart like this is relatively expensive to produce, and the quantity is rigidly limited, a copy is yours—free for the asking—if you request it on your letterhead. Write Dept. MM, CLARK INSTRUMENT INC., 10200 Ford Road, Dearborn, Michigan.

TOMORROW'S ACCURACY TODAY

CLARK

HARDNESS TESTER

mutator Dresser Co., 4004 Park Ave., Sycamore, Ill. To etch small tools or parts, they are simply placed on workplate and switch turned on to proper heat, the desired etching operation then being performed.

Fourteen heats (Lo—90, 150, 200, 250, 350, 450, 600 watts; Hi—300, 400, 500, 650, 850, 1,100, 1,350 watts) are provided by "Hi-Lo" tap and seven-point switch. These heats are said to be sufficient for marking all iron, steel and their alloys from small delicate parts up to large smooth castings. An indicating lamp glows brighter as each higher heat is used. When using ground clamp to etch large parts, the "keeper" must be removed from front of case and placed on workplate across transformer poles.



Ideal Combination Etcher and Demagnetizer

To demagnetize, the switch is turned on to either No. 1 or No. 2 position, the procedure then being the same as with ordinary demagnetizer. Maximum rating is 5.5 amperes. Overall pole area is 13½ square inches.

The Ideal Combination Etcher and Demagnetizer measures 8¼ x 11½ x 8⅝ inches overall and weighs 39 lb. The workplate is 8¾ x 7¾ inches in size. The complete unit includes a 5-foot primary cord and plug, heat-resisting etching tool with 5-foot lead, extra point, and ground clamp with 4-foot lead.

"Abrasive" Diamond Wheels

A line of resinoid-bonded diamond wheels specially designed for the fast cutting of carbides is announced by the

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All Kinds—Any Quantity

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CORRECT SPACING ASSURED

on straight, spiral or taper work—because ball and socket—sliding member eliminates lost motion. No binding or cramping.



No. 130

RED-E Compensating Milling Machine Dog

Catalog 5-44

THE READY TOOL CO.

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New Nesting Type Tote Pans



20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.

J. L. LUCAS & SON, INC.

Bridgeport, Conn.

For Smoother Performance



USE ATLANTIC Contour Cutting BAND SAW BLADES

You will welcome Atlantic Band Saws in your shop. The teeth are set to permit a smoother performance for radius cutting. The special alloy steel insures longer wear *and* you can weld them easily.

IMPROVED PACKAGE

One of the strongest, most practical and convenient boxes on the market. Cutaway feature shows inventory at a glance.

Box is solid chipboard construction that won't come apart. Saw securely held in coil form, no bothersome wires to cut. Required lengths freely removable. Marked on end as well as top of box for easy identification. Packed in all widths 3/32" to 1/2" wide in 100' lengths. Number of teeth as permitted by W. P. B. ruling.

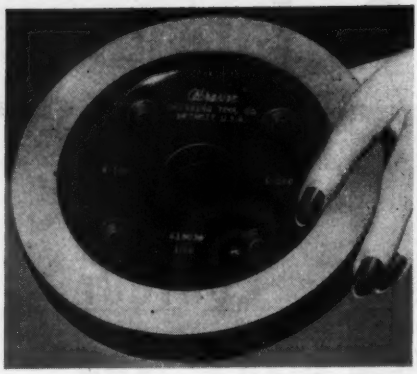


Send for Atlantic Band Saw Booklet

ATLANTIC SAW MFG. CO., Inc.

Manufacturers of Metal Cutting Band Saw Blades Exclusively

155 Brewery St., New Haven, Conn.



"Abrasive" Diamond Wheel

Abrasive Dressing Tool Co., Detroit, Mich. According to the manufacturer, the wheels can be used for producing uniform cutting edges on carbide-tipped tools of all kinds, for the removal of excess metal on carbide dies, and for the radius grinding of mounted carbide tips.

Included in the Abrasive line of diamond wheels are straight, pointed, and rounded types with diamonds in the peripheries, as well as plain cup, flaring cup, and dish types with straight or beveled insides. Hand lapping holes with diamonds at either one or both ends are also available from the company.

Outstanding feature of the Abrasive Diamond Wheel is a special design which is said to assure a "cool" wheel, thus providing for unusually long life and fast cutting action. Facilities are also available for the production of diamond wheels in special shapes and sizes to specifications.

Harper High Temperature Electric Furnace

A line of high temperature electric furnaces for sintering powdered metal at temperatures between 1,800 and 2,750 deg. F. is announced by the Harper Electric Furnace Corp., Niagara Falls, N. Y. Each furnace is equipped with a preheat tunnel leading to the high temperature chamber and a water-jacketed cooling chamber. The entrance to the preheat tunnel and the exit on the cooling chamber are equipped with automatic flame curtains.

DESMOND GRINDING WHEEL DRESSERS



Desmond Hex Dresser



Desmond Heavy-Duty Dresser



Desmond Huntington Dressers

Our Desmond Huntington Cutters are made in all sizes.



We manufacture only complete line of dressers and cutters on the market, and will be glad to send samples for trial. Write for copy of our new catalog and name of your nearest jobber.

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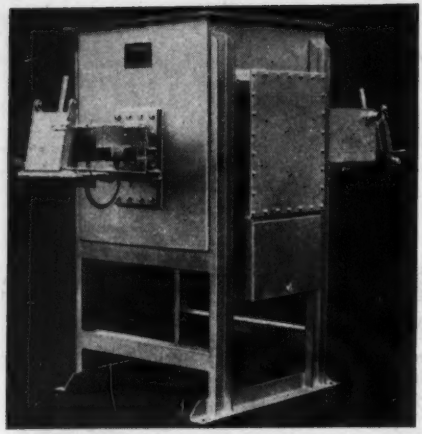


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Precision-built. Delivers pressures up to 140 lbs. With gauge, $4. Less gauge, $2.50

AIR FILTER
Keeps water and particles out of the regulator and pneumatic tools. $1.50

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Looks and operates like a gun. Ideal for cleaning and blowing out chips, dust, filings, scraps, etc. . . . $2.50

W. R. BROWN CORP., 5725 ARMITAGE AVE., CHICAGO 39, ILL.



Harper High Temperature Electric Furnace

According to the manufacturer, gas-tight furnace construction permits the use of protective atmospheres, such as hydrogen, dissociated ammonia, and mixtures of carbon monoxide, hydrogen and nitrogen. Extremely accurate temperature control and maximum life of heating elements are said to be provided for by the design of the unit.

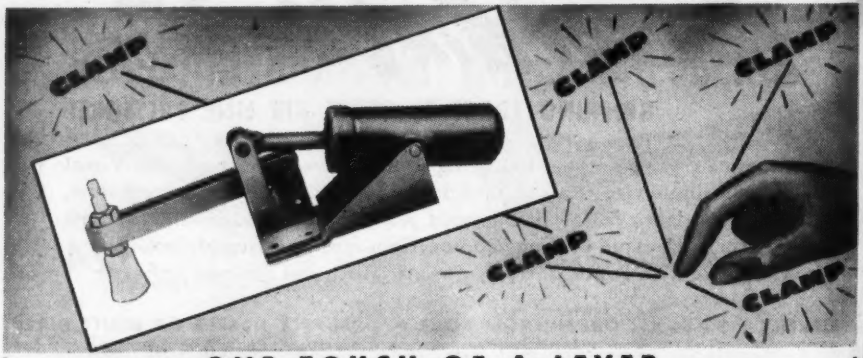
Applications of the Harper High Temperature Electric Furnace include high temperature cementing of tungsten carbide dies, sintering of powdered ferrous and nonferrous metal parts, heating of electronic tube parts, and so on. In addition, the furnace is said to provide correct temperature and atmospheric conditions for high temperature hydrogen brazing.

The Harper High Temperature Electric Furnace is built in sizes to meet requirements ranging from those of laboratories to volume production.

Hammond "Auto-Doper"

An automatic air-operated composition applicator for use on any type of polishing and buffing machine, to be known as the "Auto-Doper," is announced by Hammond Machinery Builders, Inc., 1615 Douglas Ave., Kalamazoo 54, Michigan.

The design of the unit is such that it can be used with either cylindrical or rectangular bars by merely changing the composition housing for the type of



ONE TOUCH OF A LEVER
CAN CLAMP DOWN AN ENTIRE ASSEMBLY SECTION

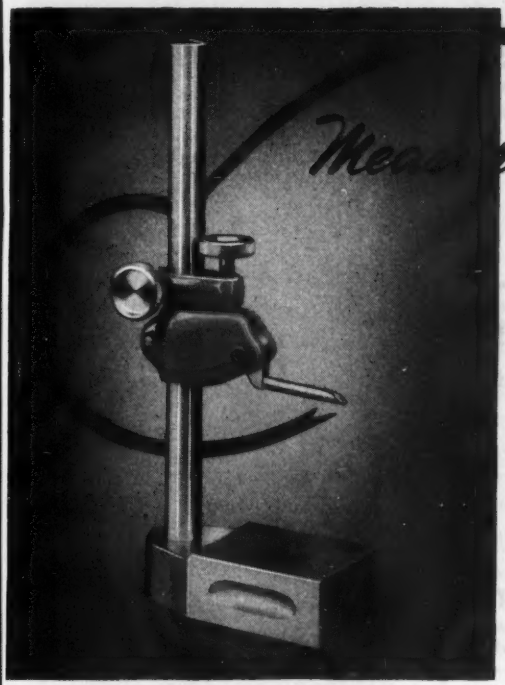
From one control station a man can operate all the clamps around the extensive perimeter of an airplane section — or any other large assembly. He can make all the clamps come down simultneously or at staggered intervals. He need not spend any time repeatedly walking around the work to operate each clamp individually.

Primarily developed to facilitate airplane construction, Airops are rapidly being adopted for many other kinds of production because of their time — and labor-saving features.

Airops operate on regular shop air line. Air itself does not exert pressure, merely serves to actuate clamp. Toggle locks the clamp and holds work firmly.

If your production requires clamping of expansive surfaces, investigate the advantages of Airops.

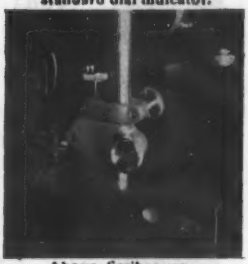
AIROP, INC. 12841 Ford Road Dearborn, Mich.



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Above: Comparator use with standard dial indicator.



Above: Scriber use.
Below: Height gauge use.



● The Dickerman Height Gauge has a wide range of usage as a height gauge, comparator or scriber. It is ruggedly constructed, accurately machined and perfectly fitted for precision measurement.

This gauge can be used for fine settings due to the differential screw adjustment. Measurement in the tenths of thousands is quickly and accurately attained.

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VERY HARD TEETH

. . . to give the best of *wearing and cutting* qualities.

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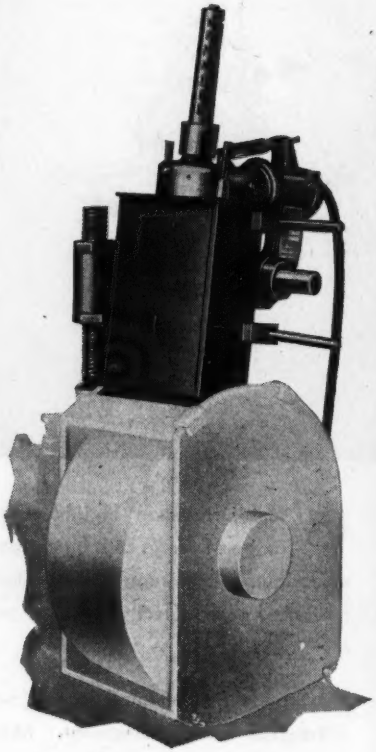
General Sales Agents

JOHN H. GRAHAM & CO. INC.

105 Duane St., NEW YORK, N. Y.

bar required. The unit is operated by compressed air, and the frequency of operation is controlled by an air valve operated from a cam, electrical timer, or foot valve as the requirement may indicate.

The Hammond Cylindrical Auto-Doper (Type ADC) is designed for use with cylindrical composition bars up to 2¾

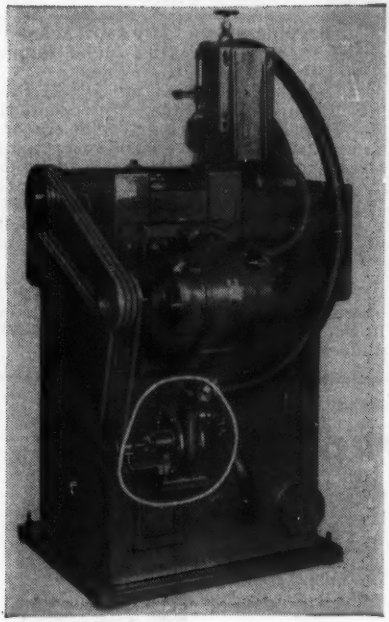


Hammond Type ADR Rectangular "Auto-Doper"

inches in diameter and 10 inches long. The composition bar is partially rotated at each stroke, thus permitting the full diameter of the bar to be used regardless of the width of wheel. The Hammond Rectangular Auto-Doper (Type ADR) can be used with composition bars from 2 x 2 inches up to 2 x 12 inches wide and 10 inches long for applying composition to wheels from 2 to 12 inches in width.

FULFLO PUMPS and VALVES

FULFLO



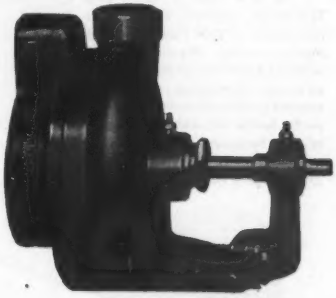
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Scores of models enable you to select the pump to serve you best . . . special models for special purposes, of course.

Sizes 3/8" to 1 1/2".
Flexible, compact, simple.
Right or left rotation.



Model AOR

Write for Fulflo Mechanical Data Book.

THE FULFLO Specialties Co., Inc.
BLANCHESTER, OHIO



Physicists Type R Piloting Fixture

Physicists Type R Piloting Fixture

The surface-roughness measurement of piston rings is said to be easily and accurately accomplished with the aid of the Physicists Type R Piloting Fixture shown herewith, product of the Physicists Research Co., 343 S. Main St., Ann Arbor, Mich. The side surfaces of various types of rings, including keystone rings, may be measured with the fixture, which is designed for use in conjunction with any Profilometer.

A ring may be measured in three ways: (1) by tracing circumferentially, (2) by tracing radially at one place on the ring, and (3) by a combination of both at the same time. Operation is entirely automatic, with switches provided for selection of the type of stroke desired. An automatic shut off is provided to stop rotation of the ring as the gap approaches the diamond point, where damage might occur.

The Physicists Type R Piloting Fixture is intended for production checking of piston rings. The tracer is automatically advanced and retracted for measuring each ring. Rings can be easily inserted and removed, and very little adjustment is required for handling rings varying from 2 to 10 inches inside diameter. The same is said to be true for keystone rings.

The Type R fixture is designed for operation on 115-volt, 60-cycle power lines. It measures 10 x 22 x 7½ inches and weighs 95 pounds.





"Come, Hotchkiss . . . I know those Armour discs make work easy, but you're ruining plant morale."

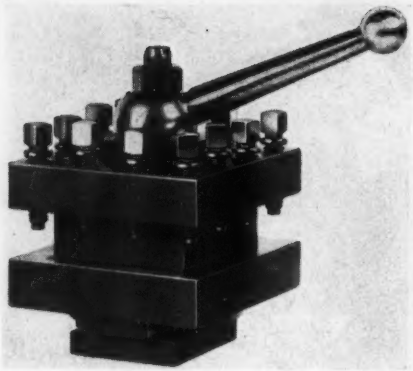
SERIOUSLY, you can't buy an easier disc to work with than an Armour Fibre Combination Sanding Disc. And that's because the Armour disc is a *faster*, *sharper*, *cooler* cutting abrasive tool. The extra hard, extra sharp aluminum oxide abrasive is anchored to the cloth and fibre backing with a vise-like Armour glue...made *especially* for this purpose!

The fibre combination sanding disc is only one of a complete line of Armour abrasives . . . a line which includes belts, cones, sheets, bands and other more specialized shapes. All are built to the same high standards . . . are designed to give you longer-wearing, sharper-cutting abrasive tools. Whatever your abrasive problem, there's an Armour product that will solve it efficiently and economically.



Armour Sandpaper Works

DIVISION OF ARMOUR AND COMPANY
1355 West 31st Street, Chicago 9, Illinois



Enco Heavy Duty Turret Tool Post

Enco Models HD-1 and HD-2 Heavy Duty Turret Tool Posts

Enco Mfg. Co., Dept. U, 3321-23 Montrose Ave., Chicago 18, Ill., announces the production of two heavy duty turret tool posts for use on large lathes requiring extremely rigid and accurate tool-holding devices.

Designated as the Models HD-1 and HD-2, the turret tool posts may be indexed to 12 positions, thus providing three different working positions for each tool. As a result, one tool may be used for more than one operation, thereby reducing set-up time to a minimum.

Matthews "Quick-Set" Tag Embossing Machine

Metal tags for every identification purpose are said to be quickly embossed by means of the Matthews "Quick-Set" Tag Embossing Machine shown herewith, product of Jas. H. Matthews & Co., 3944 Forbes St., Pittsburgh 13, Pa. The machine is designed to meet the need for frequent changes in setup and will accommodate either coiled sheet metal strips, which are cut into tags of any desired size, or tags already cut to size. Manufactured to order, the machine can be supplied to emboss as many as 16 characters, from $\frac{3}{16}$ to $\frac{1}{2}$ inch in size, at one time, with each embossing bar limited to maximum of 13 characters. Maximum tag thickness recommended for use with the machine is 24 gauge, however, under certain conditions, heav-

The Grip That Prevents A Bad Pinch!

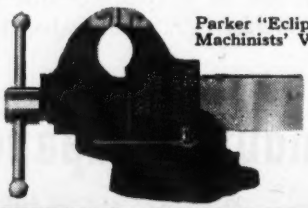


The handle of the Parker Vise is held securely, gripped in position for any leverage, by an adjustable tension spring. This important feature protects workers' hands against pinching, and permits fast work with the handle centered.

Where your production depends upon the use of vises, output is speeded materially by Parker Vises. Their up-to-the-minute design, which provides quick, positive centering of the handle, assures faster action. An extra feature . . . easy lubricating of the screw . . . is another reason why it pays to use this product of the Master Vise Makers. The Charles Parker Company, Meriden, Conn.

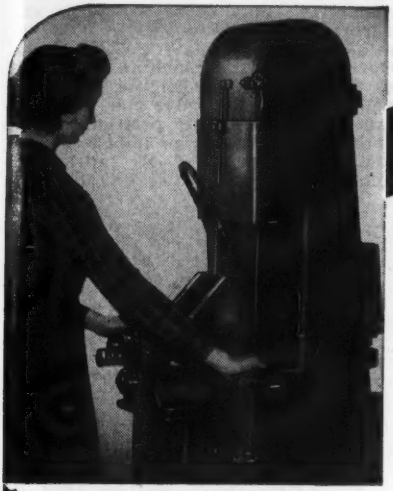


Parker "Eclipse" Machinists' Vise



PARKER VISES

America's Oldest



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Porter-Cable Wet-Belt Surfacers everywhere are helping production schedules, simplifying operations, reducing investments in machines, jigs, fixtures, and turning out the work faster, at less cost, and WITH SUPERIOR FINISH. Get the facts! Send today for our new booklet!

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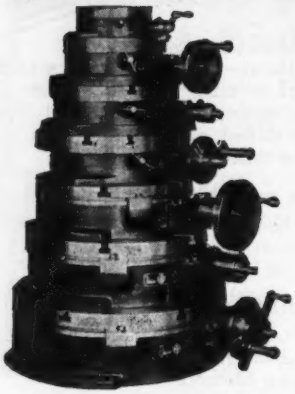
WORM GEARING — THREAD GRINDING

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

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Troyke Rotary Tables

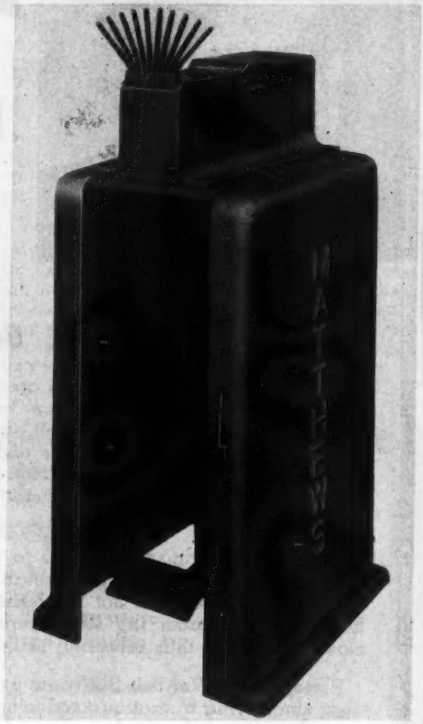


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ALFRED A. TROYKE
4422 Appleton St. Cincinnati, Ohio

ier materials may be satisfactorily embossed. The machine will emboss one line of characters only.

Operation of the machine is simple. The projecting levers on the top of the machine are used to move steel bars forward or backward into position for the embossing operation, as indicated in a view window provided on top of the machine. The material is placed into a



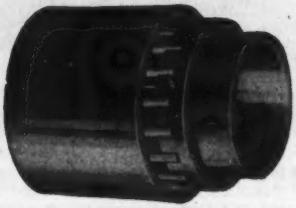
Matthews "Quick-Set" Tag Embossing Machine

side slot and quickly embossed by means of slight pressure on foot treadle.

The Matthews Quick-Set Tag Embossing Machine can be furnished in the floor model as shown or in a bench model. The unit shown occupies a floor space of 18 x 18 inches, is 39 inches high, has a net weight of 165 lb. and shipping weight of 225 pounds.

Due to the variance in coil stock thicknesses, inside diameters, and so on, stock reels are not included with the

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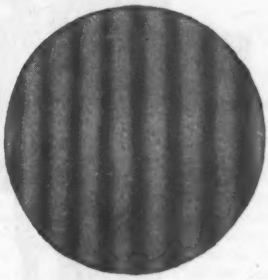
U. S. HEADS
STANDARD SINCE 1915



Two Spindle Head
Both Spindles
Adjustable

The United States Drill Head Co.
1954 Riverside Drive
CINCINNATI, OHIO

Determine Surface Flatness to Millionths of an inch with



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ACME
OPTICAL FLATS

Illustration shows interference bands reflected from a truly flat surface as they are seen through an Acme Optical Flat. The straightness of the bands determines the flatness of the surface.

Our new booklet, "Shop Measurements to one millionth of an inch," describes in simple detail how light waves are used to measure in micro-inches. Write for a copy today . . . it's yours for the asking.

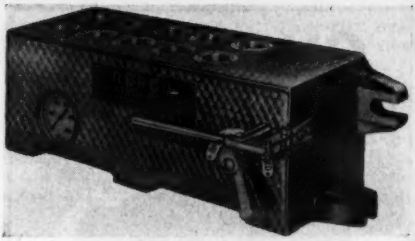
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Makers of Standardized Jig and Fixture Bushings
212 N. Laflin St. Chicago, Ill. MONroe 4122

machine, however, can be installed if desired. Metal tag blanks are available in sizes, gauges, and quantities desired. Coil stock can be supplied in various widths, gauges, and lengths.

Aerco Multi-Grip Milling Machine Chuck

Designed to allow for the milling of several workpieces in one setup, a hydraulic multi-grip milling machine chuck has been placed on the market by the Aerco Corp., Hollydale, Cal. As shown, the chuck features two rows of five collets for holding parts. Since both rows of parts may be milled simultaneously, ten parts may be milled with one loading.

A few strokes of a hydraulic hand pump supplies the necessary pressure for closing all collets simultaneously, building up pressure to as much as 2,500 p.s.i. Work is thus held rigidly in collets and cannot turn or be pulled out during milling operations, it is claimed. However, the clamping pressure may be instantly released when desired and the self-opening collets quickly reloaded.

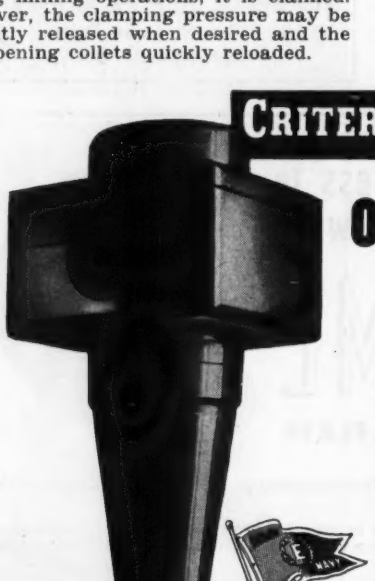


Aerco Multi-Grip Milling Machine Chuck

According to the manufacturer, the use of self-aligning collets ensures perfect on-center milling regardless of slight shank diameter variations. An automatic safety stop prevents damage to collets should all stations not be filled. The collets themselves operate on a double taper—one at each end—which is said to increase the applied pressure far beyond that needed for successfully holding the work. An adjustable depth stop provided for each collet enables the operator to quickly insert the work to the exact required amount without the use of gages or other devices.

The Aerco Multi-Grip Milling Machine

CRITERION *Boring Heads*

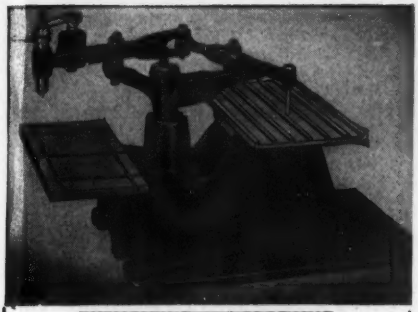


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Noted for maintaining original accuracy over a longer period Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

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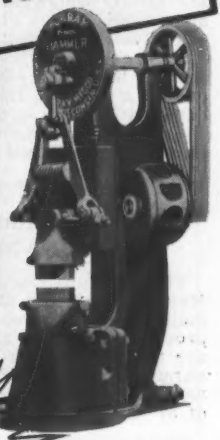


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Norton 57 Alundum Grinding Wheels



Chuck is available in two models designated as the 10-B and 10-E. The pump, valves, pressure gage, depth gage, and collet assemblies are all incorporated in the main body of the chuck itself. The Model 10-B measures 14¼ x 4½ x 4¼ inches and has a collet capacity of from ⅛ to ½ inch. The Model 10-E measures 21 x 6¾ x 6¾ inches and has a collet capacity of from ½ to 1¼ inches. Round, square, and hexagon collets are available for both chuck models.

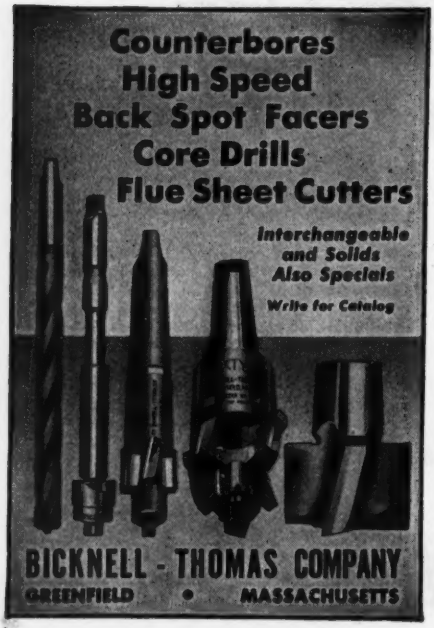
Norton 57 Alundum Grinding Wheels

The Norton Company, Worcester 6, Mass., announces that grinding wheels made of an improved aluminum oxide product known as 57 Alundum abrasive are now available for general use. This abrasive is said to be more friable than regular Alundum abrasive, thus, wheels of 57 Alundum have a fast, cool cutting action as they tend to keep themselves sharp. However, these wheels are said to be capable of maintaining their shape and to require few dressings. They are claimed to be especially useful in crankshaft grinding where the ability of the wheel corner to stand up is important.

Norton 57 Alundum Grinding Wheels are available in the patented Norton BE vitrified bond as well as in regular vitrified bond in a wide range of grain sizes, grades, and structures.

Reimuller Hy-Speed Gap-Style Hydraulic Press

Rugged all-steel construction and simplified hydraulic foot control are outstanding features of the Reimuller Hy-Speed Gap-Style Hydraulic Press shown



ANDERSON BALANCING WAYS
Pillow Block Type

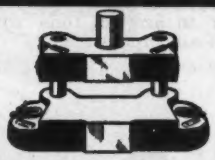


A sub base can be made of proper height to give necessary clearance for large diameter work.
Supersensitive ball bearings and hardened and ground spindles assure accuracy.

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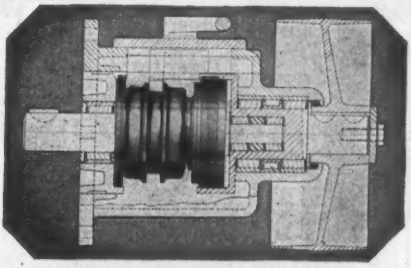
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How PULLMORE CLUTCHES Benefit New and Improved Machines

This example shows the clutch unit bolted directly onto the machine. The input pulley runs continuously. This single type PULLMORE application, with multiple disc brake, is but one of hundreds of ways that PULLMORE CLUTCHES are benefiting new and improved machines.



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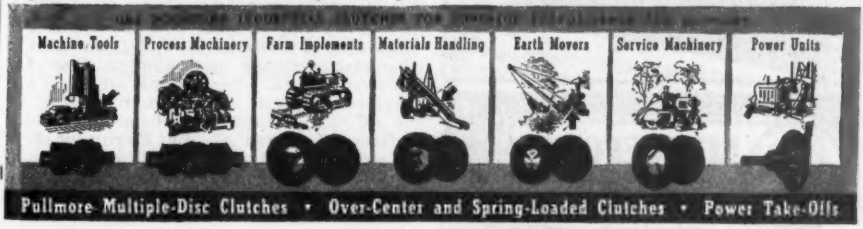


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Pullmore Clutches are Sold by Morse Chain Company, Offices in principal cities.



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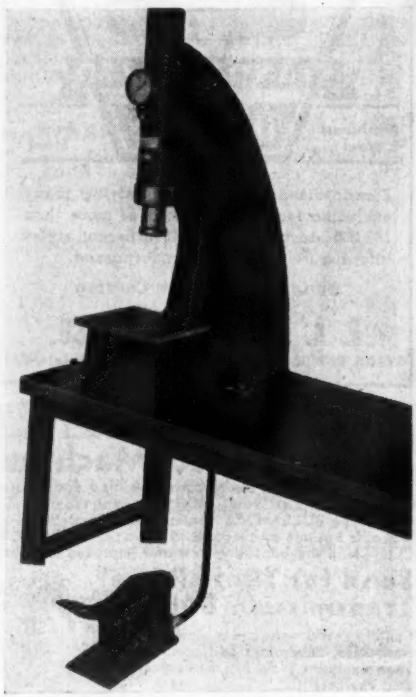


LITTLEFORD

LITTLEFORD BROS., INC.
433 E. Pearl St., Cincinnati 2, Ohio

herewith, product of the Reimuller Brothers Co., 9400 Belmont Ave., Franklin Park, Ill. The press is designed for assembling, broaching, grooving, riveting, sizing, straightening, marking, forming, and numerous other small press operations. It is available in two models of 10 and 20 tons with 50 per cent overload capacities.

The hydraulic foot control makes use



Reimuller Hy-Speed Gap-Style Hydraulic Press

of two levers, one for applying even pressures of any degree as rapidly or as slowly as desired, and the other for releasing pressures. In this manner, the operator's hands are always free for handling work. No outside air lines are required for the unit, which is said to be self air-eliminating without bleeding.

Other features of the Reimuller Hy-Speed Gap-Style Press include a hollow, large area, ground ram for receiving punches, dies, and fixtures; packless sealing rings; aircraft style piston ring

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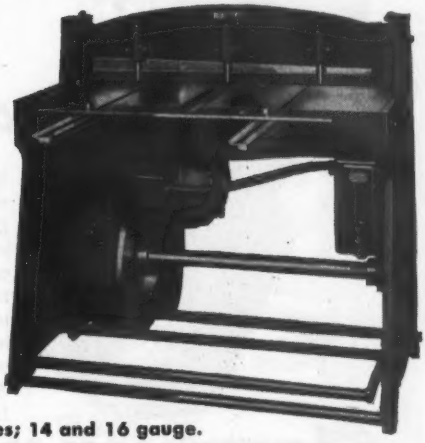


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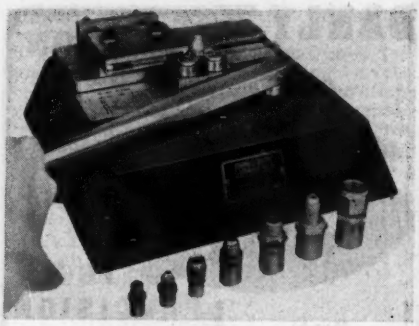
WHITNEY METAL TOOL COMPANY
110 FORBES ST. • ROCKFORD, ILL.

plungers; twin pressure gage showing pressure in system; and design which makes press readily portable.

Acromark No. 926S Bench Marking Machine

Primarily designed for production marking of hose couplings, the Acromark No. 926S Bench Marking Machine shown herewith, product of The Acromark Co., 9 Morrel St., Elizabeth 4, N. J., is so constructed that it may be readily altered to accommodate parts of like nature. The die holder is designed to take solid dies or interchangeable type, both of which can be changed by loosening a single set screw. Manufacturing tolerances on type and dies are carefully maintaied so that they may be used in combination if desired.

A unique method of accommodating the different sizes of parts to be marked is employed. A series of carefully ground plates is slipped over the vertical rollers to bring each part into marking position. The only other adjustment to be made is that of marking depth which is readily controlled by two fine pitch



Acromark No. 926S Bench Marking Machine

screws. The die holder is so constructed that compensation for pieces of slight taper may also be made.

With the exception of the die holder and operating handle, all movable parts of the machine are contained in the sturdy cast iron base. Internal gearing is such that the actual marking operation is said to be accomplished with little effort. Cast lugs provided on the base are drilled so that the machine may be fastened to a bench.



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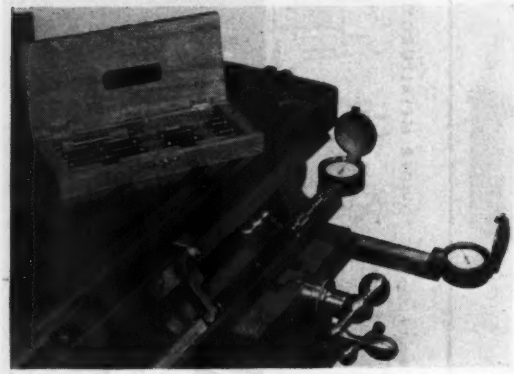
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rods, micrometer heads and indicators which, when properly installed on latest model Index Mills, will enable operators to locate and bore holes in an area 8 x 16 inches. The indicators are graduated in 0.0001 inch, the graduations being so spaced that semi-skilled operators are said to have no difficulty in locating holes exactly.

The measuring rods, micrometer heads and indicators are offered through the Blank & Buxton Machinery Co., 3100 E. Michigan Ave., Jackson, Mich.

Measuring Rods, Micrometer Heads and Indicators for Index Mills

In answer to the many requests by users of Index Mills for suitable accessories which will permit these machines to be adapted to close boring operations, the Index Machine & Tool Company has designed the proper attachments and equipped its plant to furnish measuring

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The Charles Stecher Co., 2452 N. Greenview Ave., Chicago 14, Ill., has placed on the market a heavy duty, self-centering roller steady rest which is especially designed for second operation work on parts such as propeller shafts and other airplane parts requiring end

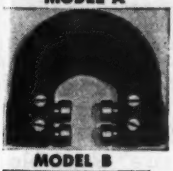




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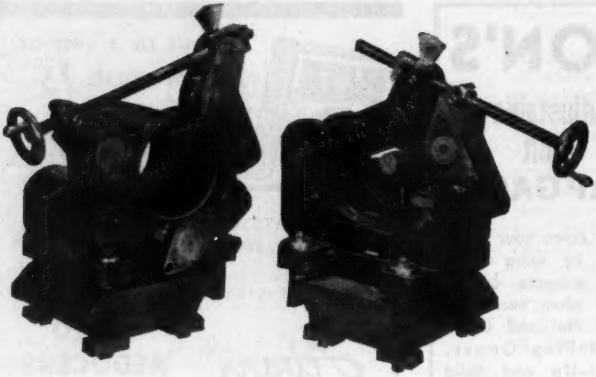
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machining operations on either engine or turret lathes.

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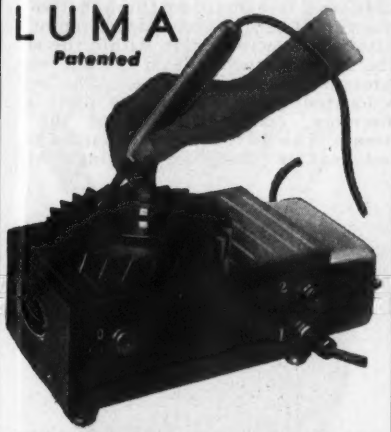
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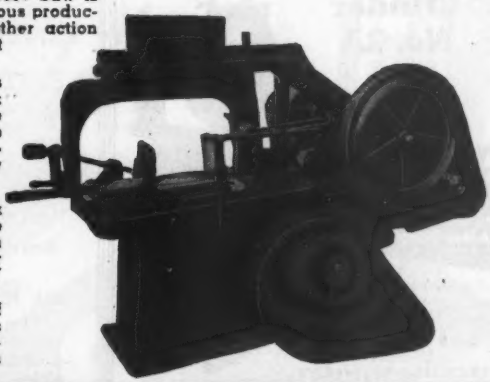
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Robertson builds a complete line of Power Hack Saws in sizes and types to suit your needs. Send for illustrated folder Form 1-A which gives complete details.

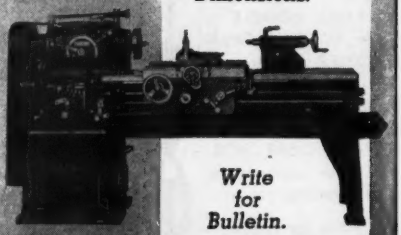


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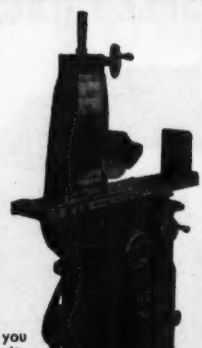
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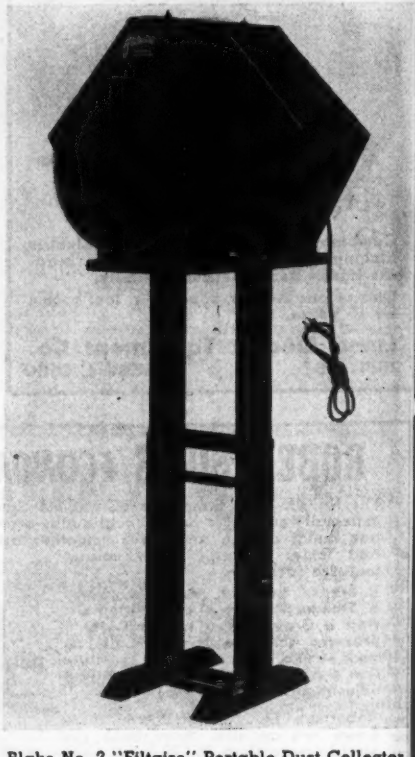
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area of the front of the Filtaire. The air is then deflected upward by a baffle plate and is exhausted through two replaceable Dustop filters at the top of the Filtaire for recirculation within the shop. The fan is connected to a 1/6 h.p. motor through a shaft and V-belt. The motor is located behind the baffle plate and, therefore, completely out of the air stream. The drive shaft is mounted front and rear in dustproof bearings which



Blake No. 2 "Filtaire" Portable Dust Collector

are furnished with grease gun fittings.

The Blake No. 2 Filtaire can be used in connection with dry grinding and polishing operations and is readily portable, thereby enabling it to be moved about the shop for use where a 110-volt outlet is available. Adjustments are provided for raising and lowering the collector unit as well as moving it back and forth, thus enabling the Filtaire to be used with various sizes of machines without the need for special piping.

CHAMPION

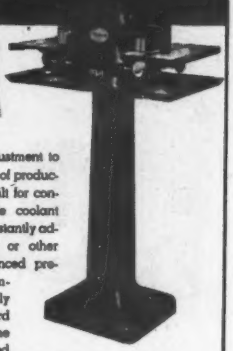
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18 WAYS TO SAVE TIME & MONEY with the MEAD Industrial Burring Machine

New circular explains, illustrates 18 ways in which the Mead Industrial Burring Machine saves time and money—also contains special Grit Guide. Every industrial plant needs this "Jack-Of-All-Trades" machine. Your burring can be done in "free time" — install these machines by every machine tool which leaves burrs. Grinds, finishes both outside and inside cut-out openings. Immediate delivery in most cases. Write for the informative Money-Saving circular now.





MEAD Specialties Co.
15 S. Market St.
Dept. 54-A
CHICAGO 6, ILL.

For METAL — PLASTIC — WOOD



Zephyr Improved Micrometer Stop Countersink

Zephyr Improved Micrometer Stop Countersink

Zephyr Mfg. Co., 201 Hindry Ave., Inglewood, Cal., announces that its micrometer stop countersink is now available with a new die-cast ribbed body and with choice of four interchangeable feet styles. Designed to take cutters up to ⅛ inch, the tool comprises only five parts and can be assembled without tools. All parts are completely interchangeable.

In addition to the streamlined body and the new flared foot, features of the Zephyr Micrometer Stop Countersink include a finger-adjusted non-slip lock and radial-thrust ball bearing which contributes to long tool life.

J. & S. Model "E" Radii and Angle Dresser

"Fluid-motion" dressing is described as the outstanding feature of the J. & S. Model "E" Radii and Angle Dresser illustrated herewith, product of the J. & S. Tool Co., 477 Main St., East Orange, N. J. The unit has a 14-inch wheel capacity and can be used to form any desired angles on wheel and concave and convex radii from 0 to 3 inches. Only one setting of the dresser is said to be required in order to obtain the combined form of radius and angles. According to

"Clutch" Type, Toggle Action



For clamping parts of varying thickness.

"Side-Action" Toggle Type



For clamping parts of uniform thickness.

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Both models of the Presto-Vise have many outstanding advantages. For example:

1. Toggle for easy operating pressure.
2. Fast loading because of speedy, extra long jaw-travel away from work.
3. Jaw pressure adjustable according to type of work being held.
4. Extra large maximum opening and deep throat allows wide range in shape of parts held.

Each model is made in 3 sizes (3", 5" and 7" jaws). Send for circular and engineering data.

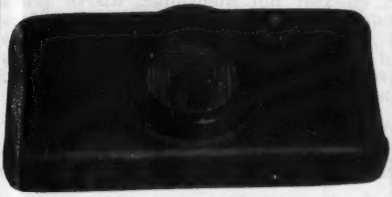
Free CATALOG

D. A. SMITH & CO.

8085 Livernois, Detroit 4, Mich.

PRESTO-VISE

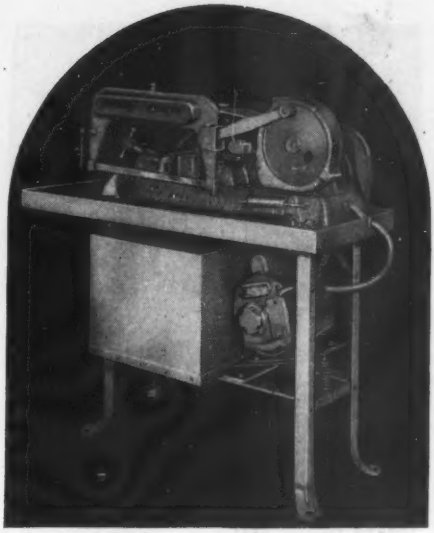
"ALL-WAY" LEVEL



The FELL Precision Level is made to show the level of all ways at once. This eliminates disturbing the first level when leveling the second. Graduations are in .0005" per foot and form squares about a circular bubble, thus giving co-ordinate readings and showing direction and amount of slope, if any.

MADE IN TWO SIZES
5½" x 12" 3½" x 6"
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Saves space Speeds work

A multitude of wet or dry metal cutting jobs can be handled efficiently on the new EXCEL Power Hacksaw at high speed. Will handle work up to 4" square stock . . . quick action vise . . . can cut at any angle up to 45°. Covel's experienced engineers built this sturdy saw to save much demanded floor space . . . floor model requires only 14¾" by 31" and the bench model even less. As an auxiliary unit or for the requirements of a small shop on a wide range of work the new EXCEL Power Hacksaw has no equal in performance or price. Write for bulletin MMX today!

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COVEL MFG. CO.
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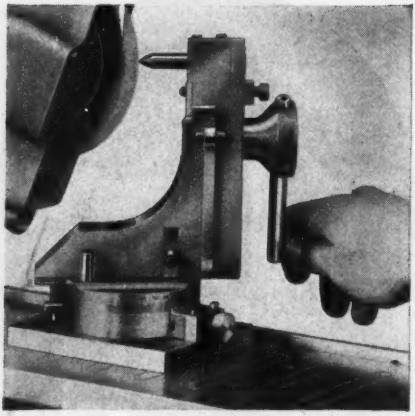
Over 4,000 shapes, cuts and sizes of **both** Swiss and American patterns.

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Carson - Newton Co.
61-71 MILL ST.
BELLEVILLE, NEW JERSEY





J. & S. Model "E" Radii and Angle Dresser

the manufacturer, wheels can be dressed to tolerances of within 0.0001 inch by means of the unit.

Easily and quickly operated, the J. & S. Model E Radii and Angle Dresser includes a ½-carat diamond which automatically returns to center position after dressing angle. The unit is of dustproof design and is constructed of hardened and ground parts to provide for long service. Rustproof gunmetal finish is optional.

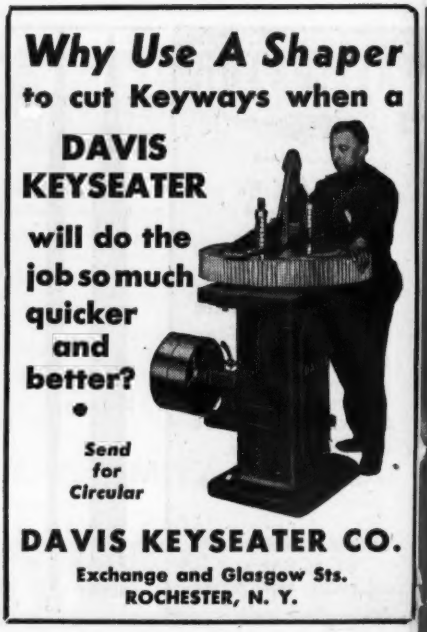
Specifications of the J. & S. Model E Dresser not mentioned above are as follows: angular travel, 2¼ inches; base, 4 x 5 inches; height, 8⅛ inches; height of diamond point from base, 7½ inches; weight, 15 lb.; shipping weight, 16 pounds.

Hilco Cutting Oil Recovery Plant

Equipment for extracting oil from metal chips, filtering and sterilizing the recovered oil is now being offered by The Hilliard Corp., 117 W. 4th St., Elmira, N. Y. The equipment completely assembled as shown in Fig. 1 in the accompanying illustration is known as the Hilco Cutting Oil Recovery Plant. A diagram to indicate manner in which the equipment functions is shown in Fig. 2.

Referring to Fig. 2, metal chips containing oil are placed in the chip wringer (1) where the oil is extracted from the chips and caused to flow into the accumulator tank (3). The oil then





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Sizes of plugs up to 10" dia.

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Hartford
"SUPERSPACER"

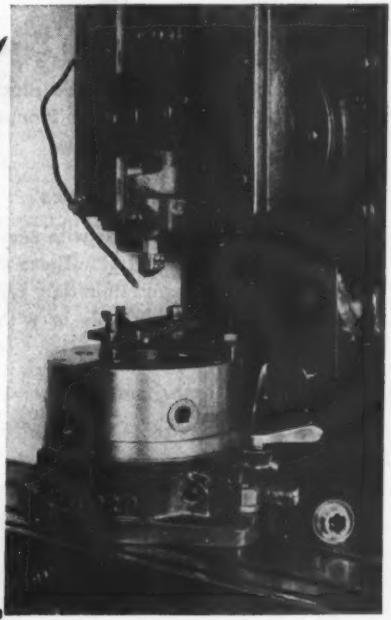
The Hartford "Superspacer" is more rigid and more rapid in operation than the conventional dividing head.

Very accurate multi-splines are being slotted in heat-treated steel as shown in this illustration.

Hartford "Superspacers" can easily be set up for one piece or thousands.

Write for complete specifications and illustrations of milling, drilling, grinding, jig boring, planning, slotting and boring operations.

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1872

The Almond Three Jaw Drill Chucks were the first to be placed on the market. They were Pioneers in the field of Drill Chucks!

ALMOND THREE JAW DRILL CHUCKS

are furnished in 9 sizes with capacities from 3/16" to 1". These are made in heavy and light duty types with a taper arbor hole or with a threaded arbor hole.

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T. R. ALMOND MFG. CO.
ASHBURNHAM MASSACHUSETTS

passes through removable baffle screens, after which a motor-driven pump (4 and 5) draws up the oil and forces it through the Hilco Hyflow oil filter (2). Here the oil is filtered clean and sterilized by electric heaters and then passed on to the clean oil tank (6).

As shown, the Hilco Cutting Oil Recovery Plant is well valved for flexible operation. Thus, if desired, the dirty oil can be removed from the accumulator tank (3) by means of the pump (4) and delivered into the dirty oil tank

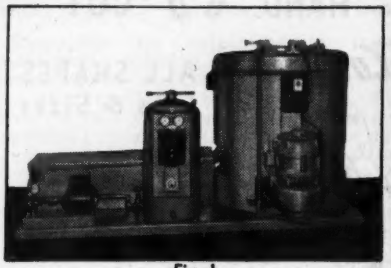


Fig. 1

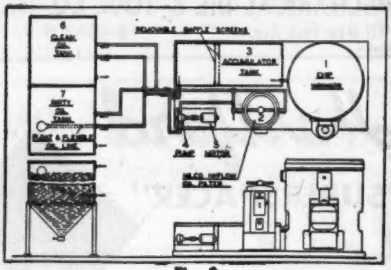


Fig. 2

Hilco Cutting Oil Recovery Plant

(7) for storage. When a large quantity of oil has been accumulated, it can then be passed through the filter (2) and into the clean oil tank (6).

The dirty oil tank (7) is fitted with a flexible oil line and float to decant oil from the surface, thus taking advantage of settling. This tank can also be used to receive various other cutting oils from machine tools for occasional purifying. Valves are arranged so that the oil may be recirculated through either of the tanks for additional purifying to any degree required. The motor-driven pump (4 and 5) can be used for dispensing oil from the clean oil tank for use as needed. The plant is available in small and large capacities.

LEVELS

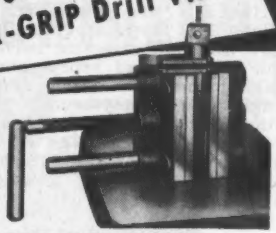
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SAVE SET-UP TIME . . .

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BRADY-PENROD MODEL 7500 Centrifugal coolant pump and tank—a neat, compact unit highly suitable for use where abrasives are a factor.

Good pumps PAY. Buy the kind used as *standard equipment by many leading machine tool manufacturers*—BRADY-PENROD. Model 7500, shown above, is one of a complete line designed to meet every need. It handles all coolant liquids—kerosene, solubles, light and medium oils, etc., 4 to 100 g.p.m. Tank sizes, 6, 15, 30 gal. or larger, with as many hoses and nozzles as required. Discharge pipe is cast integral with pump and brought to outside of tank. The hinged cover allows cleaning without disconnecting return line.



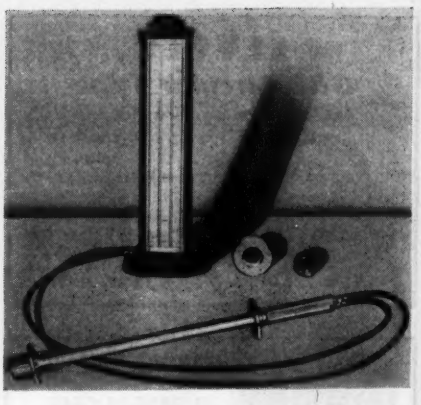
All BRADY-PENROD pumps have heavy-duty, standard construction NEMA motors, ⅛ to 1 H.P., any current, phase, cycle.

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"Metricator" Gage

An air-operated precision gage consisting of "Metricator" and gaging head is now being offered by Metrical Laboratories, Inc., 417 Detroit St., Ann Arbor, Mich. The Metricator regulates the air flow and indicates size variations, while the gaging head represents the actual gaging member. Sizes and shapes of gaging heads vary according to their applications.

The Metricator Gage can be used to measure internal and external diameters and tapers, narrow grooves, straightness, and concentricity. Designed to



"Metricator" Gage

eliminate the human element, the gage is provided with an amplification of 4,000 to 1; or 0.001 inch is represented on the Metricator scale as a distance of about 4 inches. According to the manufacturer, measurements within 0.000025 inch can be distinguished without the slightest effort on the part of the operator. The effective range of the gage is approximately 0.002 inch when an amplification of 4,000 to 1 is employed. Gages with higher or lower amplifications may be obtained if required.

The Metricator scale is calibrated to a high degree of accuracy and does not require high and low limit master gages. Only one master gage is required for each size gaging head. Whenever this master is applied to the gaging member, the instrument is said to read at the proper zero point.

The Metricator operates under an air pressure of approximately 1 lb. and can be attached to the regular plant air supply. If it is a high pressure line, a line

T. H. LEWTHWAITE MACHINE CO.



METAL LATHERS' BENDER

This machine will bend up to ½" square or round iron, 2" x ½" channel iron, 2¼" x 5/16" flat iron cold. Weight 40 lbs.

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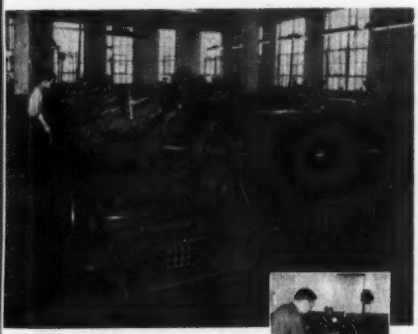
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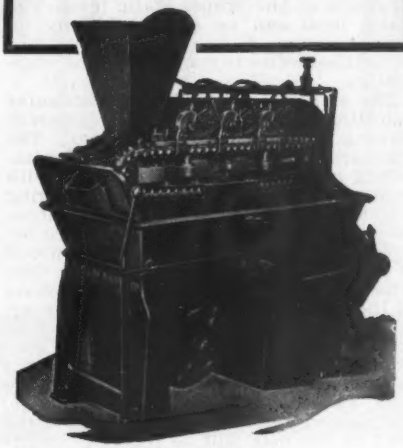
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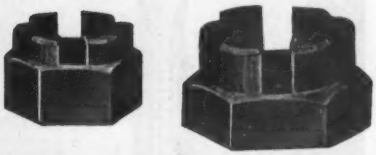
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Two continuously operating conveyors. Highest obtainable production. Automatic indexing. Automatic burr removal. As high as 3000 slotted nuts per hour. All sizes from 3/8 to 15/16 hexagon across flats. Used by all larger nut makers.

SLOTS 2 SIZES AT ONCE



PELLOW
MACHINE CO.
13510 Foley, Detroit 27, Mich.

regulator may be installed to reduce the air pressure to approximately 30 to 50 lb. According to the manufacturer, changes in the line pressure cannot possibly affect the accuracy of the readings since a constant pressure is maintained by keeping the water in the instrument at the proper static level. The static level can be corrected daily by simply adding a small amount of tap or distilled water to compensate for evaporation.

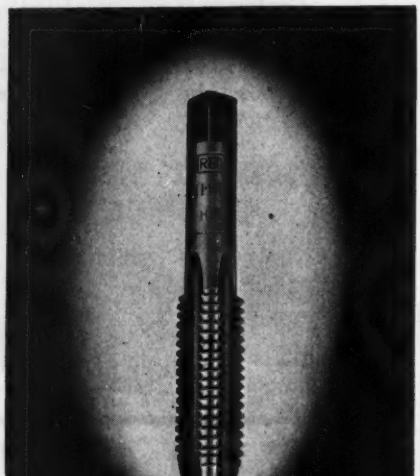
The manometer tube in the Metricator indicates variations in the air pressure flowing through the gaging head. The standard gaging head contains two measuring orifices which are recessed with respect to the outer skirt of the gaging member to provide for continued accuracy in spite of wear. The clearance between these orifices and the part which is being gaged determines the air flow which is indicated on the water column of the manometer tube in the Metricator. As the spacing increases, the air flow increases and the water column will rise. While measuring a hole, this rise will correspond to a "plus" reading of the hole diameter. If the hole is undersize, the spacing between the orifices and the wall of the hole will be reduced, resulting in decreased flow, expressed as a "minus" reading on the manometer tube.

The multi-column Metricator allows for the measuring of several diameters simultaneously. Stepped holes or holes having several diameters can be checked in one gaging operation by means of a composite gaging member. The accompanying illustration shows a two-position Metricator with a gaging member designed to measure, in one operation, the taper of a hole with reference to shoulder, and the depth of a small step at the bottom of the hole.

The Metricator Gage measures approximately 25½ inches high and 8 inches wide x 9 inches deep at the base. Shipping weight is approximately 33 lb., excluding gaging heads.

Sheffield Torsiometer

An instrument for precisely measuring the torsion of small spiral springs, to be known as the Torsiometer, is now being produced by The Sheffield Corp., Dayton 1, Ohio. The design of the unit allows for a direct reading of the torsion measurement of the spring being checked in millimeter grams on a graduated Manross scale. In this manner,



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For better Tapping at low cost let us demonstrate the durability and precision of the R&N truly modern Tap.

Write to us about your problems or if your plant is in a district covered by our service engineers we will gladly give personal attention.

Taps and Tapping has been our business for more than thirty years and we undoubtedly can be of useful assistance to you.

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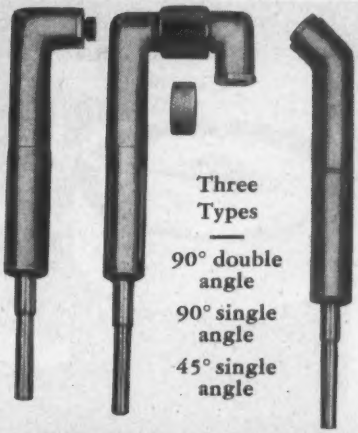
LYKENS, PENNA.

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Wear Better — Last Longer

Invincible Angle Drill Attachments reach "hard-to-get" spots, saving time and expense for you. Quickly and easily installed and serviced on the job. Patented thrust ball takes the wear instead of gears. Check Invincible today!

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The Ball Wears not the Gears!

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Actual Size

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TRY IT! METAL-BONDED DIAMOND HAND HONE

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Made in three grinding grit sizes: COARSE equals 100 GRIT MEDIUM equals 220 GRIT — FINE equals 320 GRIT

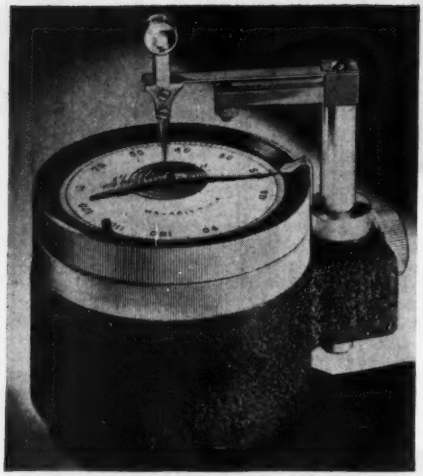
We also manufacture diamond impregnated saws. 3 to 24 inch diameter. Write for circular.

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DIAMOND TOOL REPLACEMENT CO.

(Div. of Oscap Mfg. Co., Inc.)

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Sheffield Torsiometer

springs can be identified and classified as to torsion before assembling in instruments.

The Sheffield Torsiometer will accommodate springs up to 2⅞ inches in diameter with a maximum torsion measurement of 49.5 millimeter grams. The inner end of the spiral spring to be checked is attached to the center post of the Torsiometer. The outer end is grasped by the suspended tweezers. The outer marker is then set at 120 on the scale, this representing the "zero" point, and the dial turned one complete revolution. The point at which the indicator now rests on the scale represents the torsion classification of the spring. The operation is performed quickly and easily, requiring no skill or training.

The indicator spindle rides on a jewel bearing and has a resistance of nearly zero. The pointer is made of non-magnetic material, and the pointer assembly is statically balanced. According to the manufacturer, the instrument is highly accurate as indicated by its consistent repeat readings.

Cincinnati No. 2 Releasing Box Tool

Designated as the Cincinnati No. 2, a releasing box tool that can be set up by inexperienced workers using stock

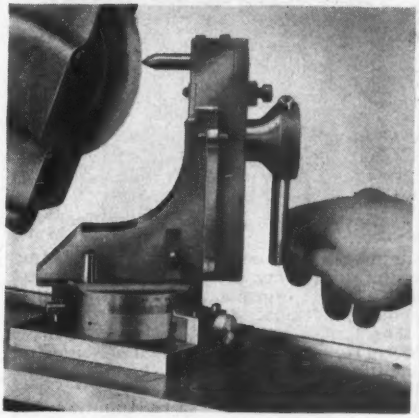


USE

Fluid-Motion for Modern form-dressing

ONE SETTING
HANDLE
CONTINUOUS MOTION

The J & S Model "E" Radii and Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable — regardless of cost.



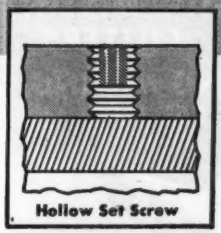
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Fluid-motion dressing
.0001" accuracy
Automatic centering
14" wheel capacity
Large range yet compact
Chatterless and dustproof

J. & S. TOOL CO.

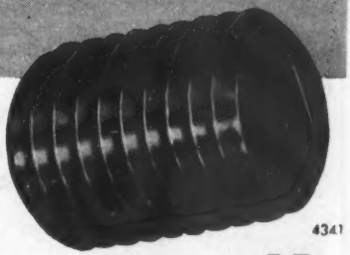
477 MAIN ST. E. ORANGE 5, N. J.

DESIGNED FOR Safety . . . BUILT FOR Strength





The natural advantages of hollow set screws include safety on revolving or moving parts, ease of assembly in confined places, and more compact construction.



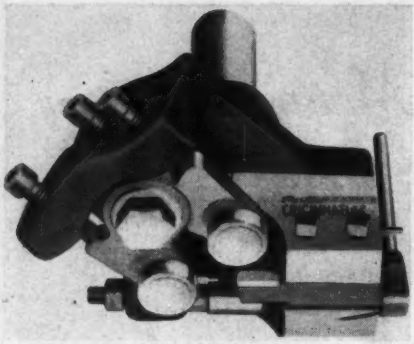
4341

The tremendous holding power of Mac-it Hollow Set Screws makes locking devices unnecessary in all but a few applications. In these cases, Mac-it Hollow Lock Screws are used like jam nuts to prevent any possibility of loosening.

Mac-its
PRONOUNCED "MACK-IT"

Other Mac-it Products Include
Socket head cap screws, Stripper bolts, Hollow pipe plugs, Hexagon head cap screws, Square head set screws.

Strong, Carlisle & Hammond Company • Cleveland, Ohio



Cincinnati No. 2 Releasing Box Tool

ground lathe tool bits is now being manufactured by the Valley Tool & Supply Co., 5507 Morella Ave., North Hollywood, California.

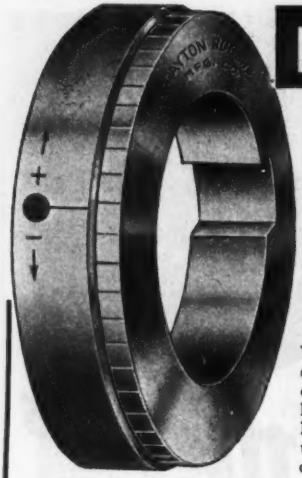
The tool is especially designed for use on turret lathes and has a capacity for turning work from ¼ to 1⅛ inches in diameter and up to 3 inches long. A retracting mechanism draws the tool bit away from the turned stock, thus leaving no mark. The retracting mechanism adjustment screw is made with a fine thread, thereby enabling the operator to easily set the tool down to the thousandth with the use of a screw driver. To allow for the performance of duplicate turning operations, the screw is locked by means of a nut.

A rocker provided under the tool bit enables the operator to locate center quickly after regrinding the tool bit. The bit is held in place by set screws which may be adjusted for setting the bit at an angle. The roller assembly may be moved in or out without changing the setting of the rollers.

The Cincinnati No. 2 Releasing Box Tool permits the use of stock ground carbide tool bits of several different types, no special ground tool bits being required.

Hufford Portable Hydraulic Elevator

A portable hydraulic elevator that can be quickly set up for operation anywhere inside or outside buildings where ordinary electric power is available has



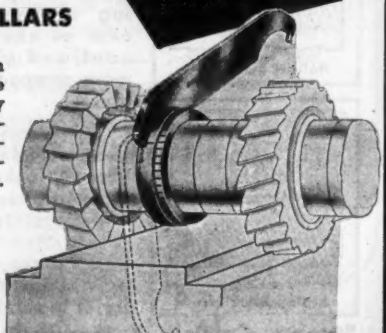
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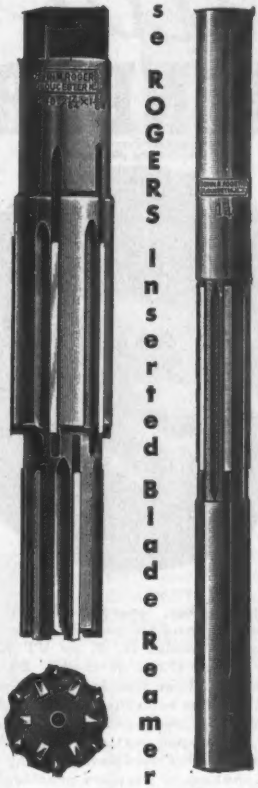
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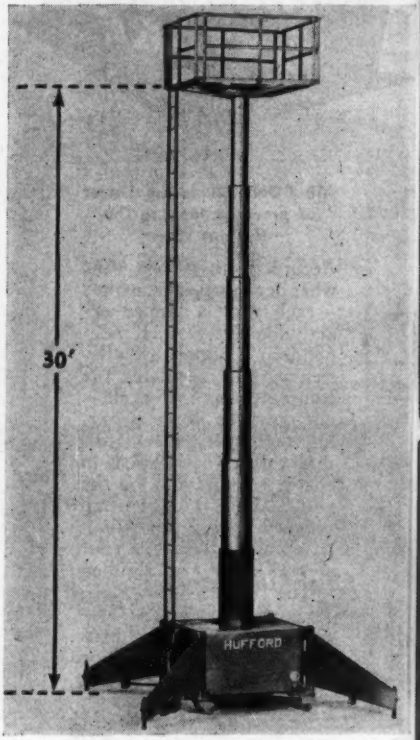
Every toolmaker, every tool crib, every machine shop and thousands of production jobs need a model H, K or VT Kipp Air Grinder or all three of them. Because of expanded facilities the delivery position on high ratings has been measurably improved. Accessories in reasonable quantities can usually be shipped out of stock. Madison-Kipp Air Grinders were developed by practicing tool makers so they are practical. They usually pay for themselves on a single job. Madison-Kipp Corporation, Madison 4, Wisconsin, U.S.A.

MODEL H $29.75

MADISON-KIPP CORP.
208 Waubesa Street
MADISON, WISCONSIN

been developed by the Hufford Machine Works, 315 Diamond St., Redondo Beach, Cal. Designed for heavy duty service, the unit is built compact enough so that it can be towed easily by a small plant towing car and will pass through a 6-foot aisle and an 8-foot door.

The illustration shows the elevator in extended and collapsed positions and in



Hufford Portable Hydraulic Elevator

position for towing. This particular model is built to lift a load of 3,000 lb. to a height of 30 feet, however, models for heavier or lighter loads and for greater or lesser maximum lifting heights can be made to meet any operating conditions required. The unit shown is designed to lift at a rate of 20 feet per minute when loaded, thus completing its extension to the full 30 feet in less than 90 seconds.

Essentially, the elevator consists of a fabricated steel base in which are lo-

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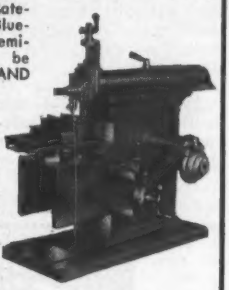
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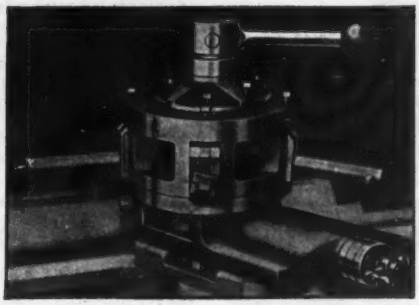
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cated hydraulic oil tank, pumps, motors, and valves; "outriggers" for holding the unit stationary; telescoping hydraulic cylinders; and 6 x 6-foot work platform. The outriggers are hinged to the base and all four must be in extended position before the elevator will operate. In addition to holding the unit stationary during operation, the outriggers provide means for taking the weight off the wheels of the elevator. The two front wheels are free-swiveling, and all four wheels operate on Timken tapered roller bearings.

According to the manufacturer, the hydraulic cylinders of the Hufford Elevator are provided with an unusually high safety factor and are designed so that the load may be off center at any time without affecting operation or safety. If, however, the elevator is loaded over its rated capacity, a sealed valve located within the steel base automatically prevents operation by shunting the hydraulic fluid through return lines to the tank. A simple three-button switch on the platform provides for easy control of elevator operation. A telescoping ladder extends with the platform to the full 30-foot height. Guard rails hinged at the bottom on all four sides of the platform can be lowered to permit loading of sections longer than the 6 x 6-foot platform and for moving elevator through 6 x 8-foot openings.



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149A Summit St., Newark 4, New Jersey

General Electric Thyratron Welding Control

A Thyratron welding control for providing precise control of low-capacity spot welders has been announced by the Industrial Control Division of the General Electric Co., Schenectady, N. Y. Coupled with a suitable welding transformer, the control can be used with either welding tongs or a small bench welder, and is particularly suitable for the spot welding of vacuum tube parts.

Other applications for which the control, in combination with proper welding transformer, is desirable include the welding of solid or stranded wires to terminals of copper, brass, bronze, steel, or ferrous alloys; joining two tinned-copper, steel, or alloy wires; and spot welding thin pieces of various alloys.

Suitable for operation on either 230 or 460-volt, 60-cycle power supply, the G-E Thyratron Welding Control is an adjustable, synchronous-precision, elec-

. . . for more than 1001 odd jobs



The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeals to every operator. That's why you'll find the better shops equipping with the Hjorth Lathe.

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Because: Wing key heat dissipation and absolute diamond lock nib.

• Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

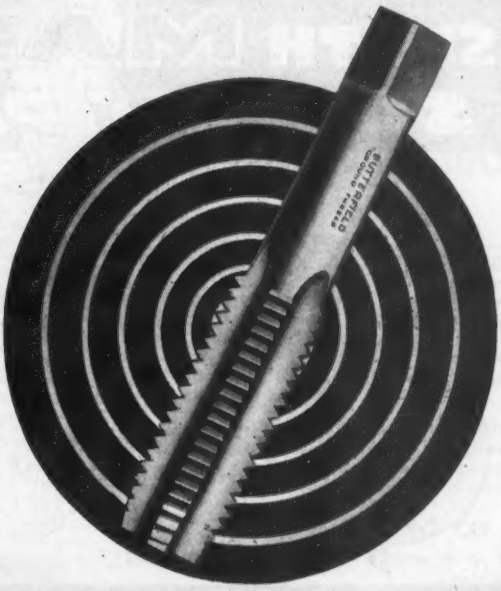
All diamond sizes ¼ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.)

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Use Butterfield "Commercial Ground" high-speed taps for best results — they will stand the gaff. Any of the stores listed below will gladly provide expert assistance in making the proper selection.

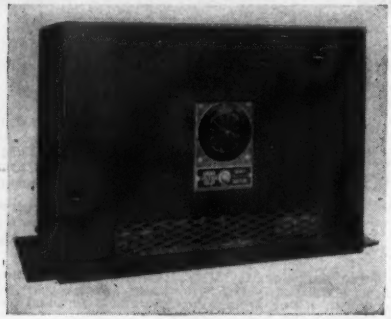
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BUTTERFIELD DIVISION

Factories: Derby Line, Vermont, U.S.A.
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tronic type in which only three Thyratron tubes perform all the functions. Two Type FG-172 tubes control the primary current of the welding transformer, and a single Type FG-97 tube precisely controls the firing time. Since the tubes have the same current rating on either voltage, the transformer used on a 460-volt supply can be twice as large as that used on a 230-volt source.



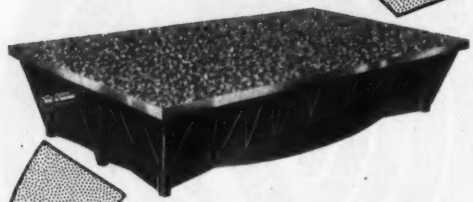
General Electric Thyratron Welding Control

The control is rated 53 amperes rms. (primary current of the welding current) on a duty cycle not exceeding 10 per cent. It is mounted in a compact, dead-front metal enclosure designed to permit the control to be attached either to the top of the assembly bench or underneath by a simple reassembly of parts. A single calibrated time adjustment on the front of the panel provides either one-half cycle or any number of complete cycles from one to 10. The removable cover of the enclosure allows for quick inspection and complete accessibility of all component parts.

DoAll Vernier Gage

Continental Machines, Inc., 1306 S. Washington Ave., Minneapolis 4, Minn., announces the addition of a vernier gage to its line of DoAll products. Used in combination with standard gage blocks, the gage can be quickly set up to form practically any type of snap, height, or depth gage which enables toolmakers and inspectors to readily measure any dimension to within ten microinches. No skill is required in setting

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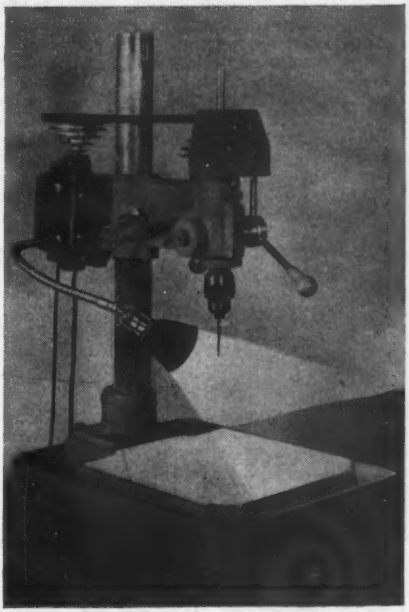
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the gage which is wrung together in the same manner as standard gage blocks.

The DoAll Vernier Gage, while being of the highest precision, is extremely simple in construction. The gage consists of two gage blocks having precision tapers on their mating faces. When the taper faces of the two blocks are wrung together with their taper index marks coinciding, the blocks form a gage block whose height is 0.700 inch. One block is graduated into ten equal parts between the index markings. By sliding this block to the right, the height of the vernier gage is increased ten millionths for each graduation because of the taper. By sliding the block to the left, the height of the vernier gage is decreased ten millionths of an inch for each graduation. The vernier gage has a total range of one ten-thousandth of an inch, plus or minus.

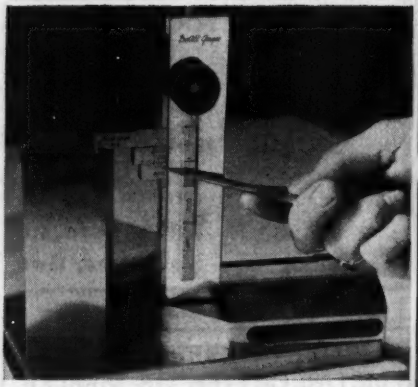


Illustration showing DoAll Vernier Gage being used in combination with precision gage blocks, gage block holder and master flats to form height gage

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ARTUS Arbor Spacers made of plastic in various colors identify thickness at a glance! .001, .0015, .002, .003, .005, .0075 .010-.030. Speed up accurate fitting at low cost. *Write for folder.*
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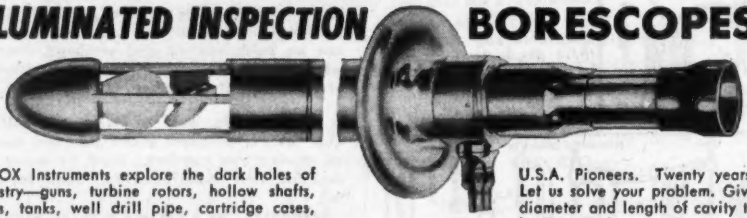
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Clamp directly over work. For use on all machines with T-slots. Standard and Heavy-Duty type.
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An intercommunication system utilizing a patented "Hold-A-Matic" push-button switch has been developed by the Talk-A-Phone Mfg. Co., 1219 W. Van Buren St., Chicago 7, Ill. Designated as the Model C-410, the system enables the executive to coordinate his entire

ILLUMINATED INSPECTION BORESCOPES

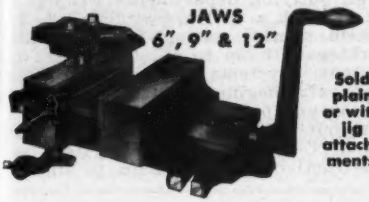


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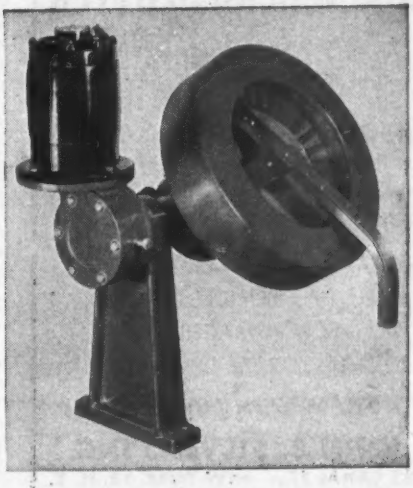
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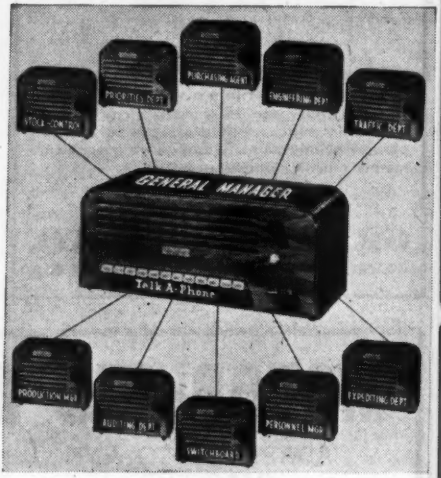
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JOHN B. STEVENS INC.
482 CANAL ST., NEW YORK 13, N. Y.

plant by having all departments at his fingertips.

As shown in the accompanying illustration, the general manager, or master station, can communicate with one, two, or all outlying departments without going through a central switchboard. This system consists of one master station working with up to a total of ten substations. Systems may be built up progressively beginning with one master station and one substation.

An outstanding feature of the Talk-A-Phone C-410 Coordinator System is a construction which is said to shut out



Talk-A-Phone C-410 Coordinator System

at the master station all sounds originating at the substation locations, yet permit substations to originate calls to the master station at will. An auxiliary feature built into the C-410 is "X-tra Power," used when certain applications, because of their high noise levels, require additional power. By merely pressing a button marked "power," a HP-16 booster is brought into action and the call is powerfully amplified so as to penetrate these high noise levels.

The master station has a powerful amplifier which delivers an output of 2¼ watts and operates on 110-115 volts, a.c.-d.c. The volume level is controlled by the master station. Privacy earphone with independent volume control is optional equipment for the C-410 coordinator system, which is available in 20, 30, 40, 50, or more stations.

Accurate Hole Transfer Made Easy With
NIELSEN TRANSFER SCREWS



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S. Inexpensive — Last for years. *Write for Circular.*

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Frictionless —Rotary

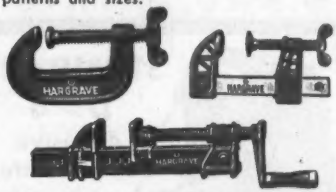
For core drilling, T. C. and high speed boring, turret tool, piloting, etc. Won't stick or clog. Dust proof as a watch. *Write for details.*

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THE CINCINNATI TOOL CO.
Est. 1879
1947 Waverly Ave., Cincinnati 12, Ohio

The **CINCINNATI TOOL** *Co.*

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ON BORING - TOOL SETTING

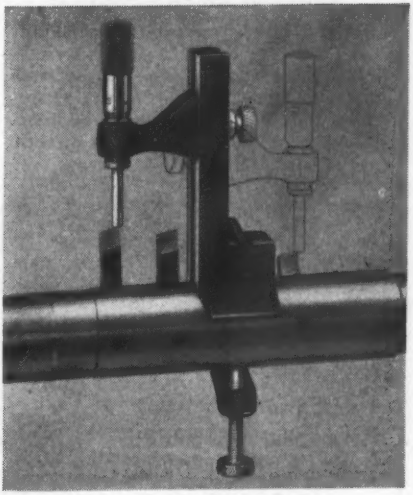
Take one trial cut, mike it, and use this gage to move the tool the exact additional amount required. Or, working from the O.D. of the bar, set the tool to exact position without a trial cut.

USE THE BARTELT PEDESTAL MICROMETER

Time wasted in conventional cut-and-try methods can be eliminated. Inexperienced operators learn to do satisfactory work more quickly. Three models available—Model B, with two-slide pedestal, shown.

USEFUL FOR MANY OTHER JOBS

Bartelt Pedestal Micrometers are also excellent for height and depth gaging, for inspection work of various kinds, and for other set-up operations. Write for circular giving full information.



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BELOIT • WISCONSIN

Allis-Chalmers "Magic-Grip" Sheave

A sheave which is designed for quick and easy mounting and demounting, to be known as the "Magic-Grip," is now being marketed by the Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. The sheave features a tapered split bushing which accommodates normal shaft tolerances and permits the sheave to be firmly locked to shaft with minimum of work.

To install on shaft, the sheave is merely slid onto shaft to position where it is in line with the sheave it is to drive or be driven by. Three cap screws are then tightened, thereby drawing the tapered split bushing farther into the sheave and locking sheave, bushing, and shaft together simultaneously. According to the manufacturer, this positive clamp fit assures that the sheave is perfectly centered and secure, thus providing for smooth running performance free from backlash and shear.



Illustration showing Allis-Chalmers "Magic-Grip" Sheave being removed from motor shaft

To take the sheave off the shaft, the three cap screws are removed. This frees bushing collar from sheave but does not release clamping action on shaft. Two of the cap screws are therefore used as jack screws by inserting them into tapped holes in the bushing collar and turning so as to separate bushing from sheave. As the bushing is released, it regains natural expansion, thereby automatically breaking the tight grip of bushing on shaft. The entire unit is then free and can easily



STANDARD D - 4 Abrasive Band Grinder

This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit.

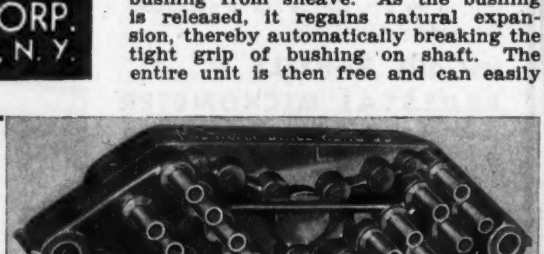
OTHER STYLES AND SIZES IN NEW BOOKLET ON FINISHING—WRITE TODAY

WALLS SALES CORP.
96 Warren St., New York, N. Y.

Pictured: a 24-Spindle Heavy-Duty Drill Head.

DESIGNERS AND MANUFACTURERS OF MULTIPLE DRILLING EQUIPMENT.

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RECOVERY and SEGREGATION of lubricant, coolant, sludge, metal chips—according to alloy, including water, semi-mud and other liquids.

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8" Insulation

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- Economical to operate.

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No. 575 Pot Hardening and Melting Furnace

- Longer pot life, as burners are near top of combustion chamber.
- Steel Pot 14" x 20". Also available with pots 14x16 and 14x18.



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Please send me Free Johnson Catalog.

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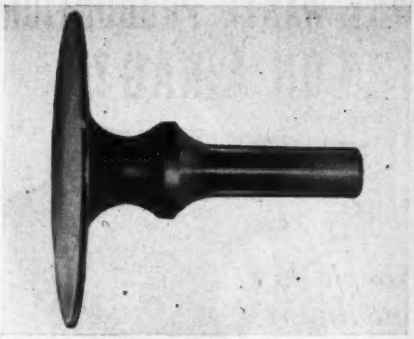
The design of the Allis-Chalmers Magic-Grip Sheave is such that the unit can be mounted unusually close to motor, thus increasing bearing life by reducing shaft overhang.

Heller Hand Cut Rotary Files

Heller Brothers Co., Newark, N. J., is now marketing a complete line of hand cut rotary files for use in flexible or stationary shaft filing machines, portable electric and air tools, and similar devices. The files can be obtained in flame, ball, cone, tree, oval, cylindrical, tapered, and other shapes recommended for the fast cutting of hard metals. Each shape is made in a number of sizes for rough, coarse, fine, and smooth cuts.

Aero Tool Oversize Rivet Set

An oversize rivet set which is said to eliminate the danger of dinging thin skins has been placed on the market by the Aero Tool Co., 231 W. Olive Ave., Burbank, Cal. Even in the hands of unskilled labor, this set with its extra large face (2½ inches in diameter) and lightweight design is said to reduce rejects and speed flush riveting operations.



Aero Tool Oversize Rivet Set

Forged from tool steel and heat treated, the Aero Tool Oversize Rivet Set has unusual impact resistance and a minimum fracture possibility. The crown surface is provided with a mirror-like ultra-smooth finish which is claimed to protect thin skins from dents and abrasions while riveting.



Prevent Oversize and Bell-Mouthed Holes!

To prevent oversize and bell-mouthed holes in tapping and reaming is no longer difficult—because, in most cases, the trouble is not the fault of the machine or the tool but is caused by the spindle not being properly aligned with the work.

This can be easily remedied by using a different type of tool holder. Change over to a Ziegler Floating Tool Holder—the type that automatically compensates for inaccuracies in spindle alignment up to 1/32"—and see what a difference it will make in the precision of the work performed.

No other tool holder has the floating action of the Ziegler. Never any friction or cramping, no matter how heavy the load! No wonder it turns out work accurately to the finest of tolerances! Try it and see.

W. M. Ziegler Tool Co.

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Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

Miccro Supreme
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LAY-OUT-DYE



FOR TOOL, DIE, PATTERN OR TEMPLATE LAYOUT ON METAL

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are made in over 1300 interchangeable combinations to meet practically any requirement. You can choose the benches you need right from stock and get them without delay. Strong, compact and of rigid construction, they stand firm and steady without costly, time-consuming bolting to the floor. Complete line fully described in the "Hallowell" catalog. Send for it now and let us know your needs.



Fig. 928.
Pat'd & Pats. Pend.
Drawer is extra.

For use where steel is war-restricted, "Hallowell" Work-Benches are available in wood "for the duration."

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

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Illustration showing Westinghouse 60,000 R.P.M. Electric Motor being checked as to speed by high frequency lamp that counts the revolutions per minute

Westinghouse 60,000 R.P.M. Electric Motor

Designed for the direct driving of grinding wheels used in producing mirror finishes on hard-to-reach parts of airplane and tank engines and other war equipment, an electric motor which operates at a maximum speed of 60,000 r.p.m. has been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. At top speed the rotor of the motor travels more than 300 miles an hour at its outside edge, less than an inch away from the center of motor shaft.

To operate at 60,000 r.p.m., the motor requires an electric current having a frequency of 1,000 cycles per second which is supplied by motor generator set having an input frequency of 60 cycles per second. Although only the size of a $\frac{1}{16}$ h.p. motor operating on ordinary electric current, the grinder motor is said to develop 80 times that much power at its top speed. Water flowing through a jacket that surrounds the motor and its bearings keeps the compact unit cool. The bearings are

Aber CURVED TOOTH Milling Cutters

with "Chatterless Flowing Action"



Patented

- **HIGHER SPEED (R.P.M.)**
- **LONGER CUTTING SURFACE**
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Types:

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GOOD MACHINE TOOLS
INSURE PERFECT RESULTS
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Specify "QUALITY" H. S. Woodruff Keyway Cutters When You Have a Tough Job To Lick

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AVIATION & AUTOMOTIVE PARTS
Gear Specialists
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Jiffy **WHEEL DRESSER**



A 5 Minute Job in 5 Seconds

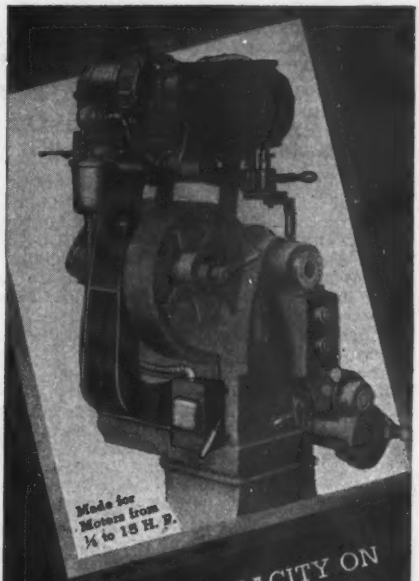
"Just a twist of the wrist"

Easily attached to standard surface grinder. Becomes part of machine. Absolutely true dressing regardless of relative position of wheel to work table, without disturbing set-up. All hardened, ground and lapped, except bracket.

Write for Bulletin 602K.

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AMERICAN STANDARD CO.
SOUTHINGTON, CONNECTICUT



FOR EXTRA CAPACITY ON
WAR WORK
INSTALL
CULLMAN DRIVES

Lathes, milling machines, screw machines, shapers, punch presses, and similar equipment driven by overhead belting can be made 25% more productive by equipping with CULLMAN DRIVES at comparatively low cost. Old type machine tools will approach the output of the newest equipment because of greater flexibility, more convenient operation, and added safety.

CULLMAN DRIVES afford belt drive smoothness. They are rigid in construction and simple in operation. They reduce necessary floor space, and permit better lighting and shop arrangement. Installation is simple and can be made quickly—usually requiring only four bolts.

CULLMAN DRIVES are sold under a 60 day trial plan. Write for the facts.

CULLMAN WHEEL COMPANY
1352-V Altgeld St., Chicago, Ill.

lubricated by a pump that forces oil between shaft and bearings — a gap less than 0.002 inch wide.

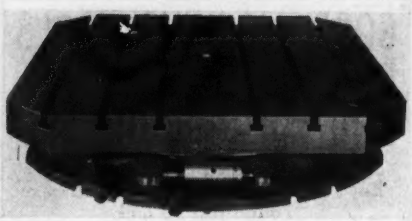
Radiac Synthetic Rubber Cut-Off Discs and Grinding Wheels

Long life and fast, free-cutting action with the production of excellent finishes are outstanding advantages claimed for the Radiac Synthetic Rubber Cut-Off Discs and Grinding Wheels now being offered by A. P. de Sanno & Son, Inc., 440 Wheatland St., Phoenixville, Pa. The discs and wheels are manufactured in standard range of thicknesses and diameters up to 20 inches.

According to the manufacturer, Radiac Synthetic Rubber Wheels are particularly effective in the wet grinding of ball bearing races and roller bearings. Synthetic cut-off discs are said to show remarkably fast cutting qualities on cold rolled and high speed steels, roller bearing stock, glass rods and tubing.

Portage Rotary Table

A rotary table for use in connection



Portage Rotary Table

with its horizontal boring, drilling and milling machine has been developed by the Portage Machine Co., Akron, Ohio. The table is available in two sizes of 36 x 36 inches and 48 x 48 inches and includes half degree graduations to allow for positive positioning at any point. Fixed bushings are provided at 90, 60, 45, and 30-deg. points.

The Portage Rotary Table pivots on roller bearings and is cast in Meehanite to assure rigidity and maintained dimensional accuracy. The base of the table is provided with hardened keys in order to permit easy alignment on boring mill table.



POWERFUL PRESSES THAT USE NO POWER

Famco Arbor Presses deliver 1,000 lbs. to 15 tons pressure, need no wires, motors, line shafts or power. Widely used with girl operators for assembly and dismantling jobs. All 32 stock sizes, bench and floor types, are easy to operate, take small space, ruggedly built yet readily portable.

FAMCO MACHINE CO., 1324 18th St., Racine, Wis.

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ARBOR PRESSES
FOOT PRESSES
SQUARING SHEARS

Famco Squaring Shears will cut up to 18 gauge mild steel. Made in five sizes. Powerful, rugged, accurate, easy to operate.



Famco Foot Presses, bench and floor types, are ideal for speeding up numerous light forming and stamping jobs



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IT'S Everlasting-
DIAMOND-POINTED
PENCIL
$10
IMMEDIATE DELIVERY

For marking glass, crystal, cemented carbides, plastics, etc. Now you're sure of a scriber with an everlasting point. Constructed with top-grade strongest point diamonds.

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An Aluminum Alloy—Non-Heat Treated. The perfected metal that surpasses all others for a wide variety of machining operations. Non-corrosive—Easy on machine tools—Holds threads without stripping. Its light weight reduces table and machine loads and increases tooling accuracy. 5 years of proven superiority in hundreds of plants. OH 38 is an exclusive Hedstrom product.

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TIME SAVER
FOR QUICK CHANGE MARKING

- Fastest and simplest way to number parts.
- Easy! Just turn screw to change numbers.
- Made of best quality tool steel.
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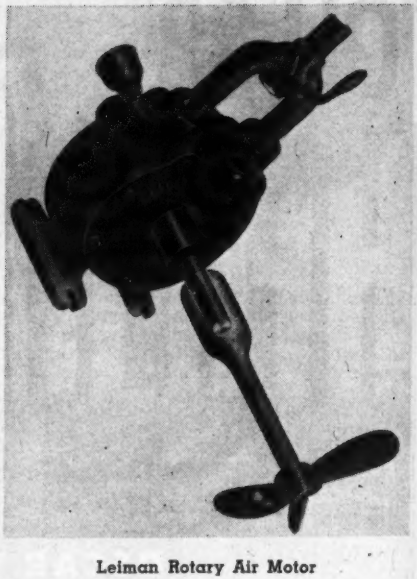
SOSSNER
161 Grand St. New York 13, N. Y.



Leiman Rotary Air Motor

Said to be especially useful where explosive or inflammable gases or materials are present, a compressed air operated motor which is designed to provide speeds of from 50 to 1,800 r.p.m. and horsepowers from 0.03 up has been placed on the market by Leiman Bros., 134-28 Christie St., Newark, New Jersey.

The compressed air used may vary from 1 cubic feet per minute up and the pressure from 10 to 100 lb. per square inch. The power and speed afforded by the motor are regulated by an air valve control which also provides for reversing of the motor when desired.



Leiman Rotary Air Motor



MANY KNURLINGS FROM STRAIGHT KNURLS

ADJUSTANGLE KNURL HOLDER



Made to fit your turret, this Holder uses the same pair of straight knurls to produce many patterns, by varying the angle of adjustment. Capacity up to 2½" work diameter.

Request Illustrated Price Circular.

GRAHAM MFG. CO.

33 BRIDGE ST. EAST GREENWICH, R. I.

Anker-Holth Two-Jaw Compensating Finger Chuck

Designed for second operation work which must be concentric with the locating surface within extremely close limits, a two-jaw compensating finger chuck is now being offered in various sizes by the Anker-Holth Mfg. Co., 332 S. Michigan Ave., Chicago 4, Illinois.



A REAL HELPING HAND

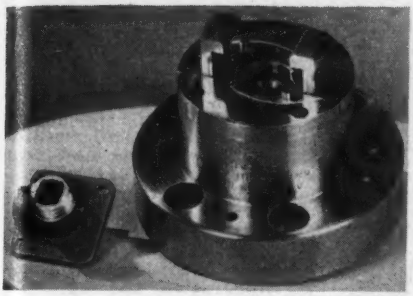
It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.



The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in ¼" to 1" diameters. *Send for price list.*

HEIMANN MFG. CO.

330 Lincoln Ave. Urbana, Ohio



Anker-Holth Two-Jaw Compensating Finger Chuck

The illustration shows a chuck which is adaptable for holding the casting shown at the left. The design of the chuck is such that the work is located from a finished round shoulder on the bottom of the casting and by two hardened and ground pins, which also serve as drivers. The plate on the face of the chuck is hardened and ground. The two jaws are so arranged that either one may be pulled in farther than the other to compensate for varying thicknesses of rough surface workpieces. The chuck body is made for direct mounting on any American Standard spindle nose, however, it can be mounted on any spindle by using an adapter.

"Fix-Iron" Cement

So-Lo Works, Loveland, Ohio, has placed on the market a cement, known as "Fix-Iron," which is said to be unusually effective for repairing broken, cracked, or defective metal castings, piping, and so on; for making joints, seams, and loose parts secure; and for stopping leaks in boilers, furnaces, firepots, and other metal equipment.

Fix-Iron is supplied in powder form and is mixed with water as used, no heat being required. The material can be quickly and easily applied with a putty knife or similar tool and may be hammered into cracked or broken parts. After metallizing, Fix-Iron is said to possess the same expansion and contraction properties as iron itself, thus assuring a permanently tight joint regardless of temperature changes.

Speed Up LATHE PRODUCTION

with these

DIX-WILDER TOOLS



Here are two real production boosters for surprising increases in both output and accuracy.

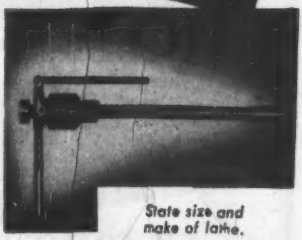
MULTIPLE CARRIAGE STOP

• Increases efficiency of both skilled and unskilled workers—reduces scrap—increases output up to 100%—4 accurate indexed positions. Price for 9, 10, 12 inch lathes $12.50; larger sizes in proportion.

AUTOMATIC COLLET CLOSER

• Fits lathes with ¾" spindle hole—accommodates 1-A collets. Positive locking—ball bearing adjustment—no sleeves—no pins—no liners—rust proofed—quickly installed. Price $50 complete.

Immediate delivery, AAS priority req. on both. Send for ill. Catalog.



State size and make of lathe.

DIX MANUFACTURING COMPANY

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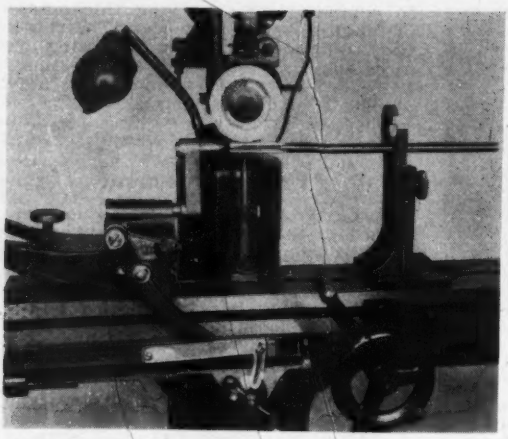


Illustration showing Cleveland Circular Relief Grinder set up to sharpen long-lead tap

Fix-Iron can be used on iron, steel, and other metals and is available in 1 and 5-lb. cans and 25 and 100-lb. kegs.

Cleveland Circular Relief Grinder

A grinder which can be readily adapted for quickly and accurately grinding circular reliefs on all sizes of short and long-lead and bent shank taps, as well as reamers, is now being offered by The Cleveland Tool Engineering Co., 1263 W. 4th St., Cleveland 13, Ohio.

As shown in the accompanying illustration, the tap to be ground is properly centered and held in place during the grinding operation by means of a constant height V-block which is used in conjunction with an offset center. While extremely simple in both principle and operation, the V-block is said to afford the unique advantage of enabling the most inexperienced operator to center a tap of any size in a few seconds.

The setup for the grinding operation is such that the exact outside contour of the tap or reamer is automatically followed. By merely setting a graduated adjustable cam at the front of the machine to the correct position, an equal

Immediate Shipment

STEEL BOXES

For YOUR PRODUCTION NEEDS



STYLE 300 STACKING BOX

Just right for your small parts. Light in weight, easy to handle. Equipped with drop handles each end. Runners save wear on bottom of box and act as positive stacking lock.

No. 301—6"x 9" x3½"—20 ga., $.55 Ea.
No. 302—8"x12" x4" —20 ga., .60 Ea.
No. 303—9"x13½"x4½"—19 ga., .75 Ea.



STYLE 700 STACKING BOX

A light weight box designed for quick identification of contents. Will stack with No. 303. Finished olive green enamel, baked on.

Each
No. 703-OG—9"x13½"x4½"—19 ga., $.95

Prices F.O.B. Factory, Philadelphia—Any Quantity! Order Today—Write, Wire or Phone.

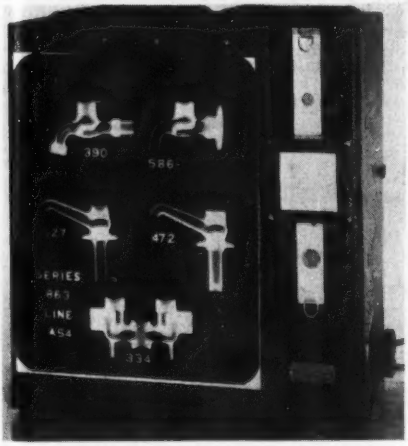
AMERICAN METAL WORKS, INC.

1507 GERMANTOWN AVENUE PHILADELPHIA 22, PA.

relief is said to be ground on each cutting edge of the tool. Thus, by making each regrind a duplicate of the original or "factory" grind, the total output of each tool is multiplied many times, thereby effecting a large savings in replacements alone.

Kelley-Koett High Intensity Illuminator

A high intensity illuminator for viewing industrial X-ray films in detail is now being produced by The Kelley-Koett



Kelley-Koett High Intensity Illuminator

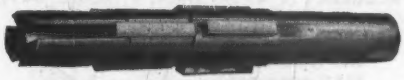
Mfg. Co., Covington, Ky. The illuminator not only provides a maximum of light but also allows for finger-tip adjustment to any desired brightness for films of different density or for different parts of the same film.

The high intensity of the unit is due to the use of "Photoflood" lamps. To prevent the great heat given off by these lamps from curling or damaging films or cracking any part of the illuminator, the unit is provided with an ingenious cooling system incorporating a built-in fan which blows air between an inner special heat-resisting glass and an outer flashed opal glass front. A footswitch control enables the lamps to be turned on only when actually required, thus greatly prolonging lamp life and easing the strain on the eyes of the observer.

TYPE A—STEP JAW DESIGN

Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

Size No.	Range of Bores Taken	Net Price
1A	½" to 1"	$12.00
2A	1" to 1½"	16.00
3A	1½" to 2"	23.00
4A	2" to 3"	34.00
5A	3" to 4"	40.00



CUT PRODUCTION TIME . . .
CUT PRODUCTION COSTS with

NICHOLSON

E-X-P-A-N-D-I-N-G

MANDRELS

Equip your shop with these time-saving tools and save both man and machine hours. Nicholson expanding mandrels are made in sizes to take up to 7" bores. It would require 193 solid arbors to fit all the fractional bores between 1" and 7". Think of the time a set of these mandrels saves.

W. H. NICHOLSON & CO.

136 Oregon St., Wilkes-Barre, Pa.



TYPE B—STRAIGHT JAW DESIGN

Adapted for work with both short and long bores.

Size No.	Range of Bores Taken	Net Price
1X	½" to 21/32"	$10.00
2X	21/32" to 21/32"	11.00
3X	21/32" to ¾"	12.00
00	¾" to ⅞"	14.00
0	⅞" to 1"	16.00
1	1" to 1¼"	18.00
2	1¼" to 1¾"	21.00
3	1¾" to 2"	29.00
4	2" to 2½"	40.00

(Other Sizes Taking Up to 7" Bores)

Hardened tool steel, accurately ground. Sold singly or in sets. Prompt delivery. Write for bulletin No. 1043.

Empire LIVE CENTER

WITH REPLACEABLE POINT

ACCURACY • HIGH SPEED • HEAVY DUTY

THE TAPERED SEAT ASSURES ACCURACY OF ± .0001



Points for Various Operations



A. Very large, for pipe or tubing work
B. Extra long point used in facing operations
C. Extra wide point for large diameter work
D. Standard point
E. Blank made of soft tool steel for nests
F. Female for work not having centers

Send for Literature



TERRITORIES OPEN

Manufactured by

KING PRODUCTS

49 SPRING STREET • NEW YORK 12, N. Y.

A special feature of the illuminator is an ultra-high intensity "spot," 3 inches in diameter, which is said to provide four times the brightness of the large section. The glass front of the spot is water-cooled, with the light from the lamp actually passing through 4 inches of water.

Zephyr Midget Swivel Head Angle Drill

No larger than a fountain pen, the Zephyr Midget Swivel Head Angle Drill illustrated herewith, product of the Zephyr Mfg. Co., 201 Hindry Ave., Inglewood, Cal., can be used to drill holes around corners in any direction throughout 360 degrees.

Features include die-cast bodies, oil-less type bronze bearings, hardened gears, and ground drive shaft. All parts are precision made. Swivel offset is 23/32 inch; spindle offset, ¼ inch; and spindle thread, 10-32.



Zephyr Midget Swivel Head Angle Drill

New Books

Practical Metallurgy for Engineers. Fourth edition. Prepared by Research Staff of E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa. 479 pages. Cloth binding, board covers. Price, $3.00.

Because of the mechanical aspects of the war, the tremendous expansion of the metal-working industry in so many divergent channels, and the greatly improved and rigidly maintained standards of measurement and testing, this fourth edition of "Practical Metallurgy for Engineers" has been published. While the function of the book is to deal with fundamentals and established practices, it also includes data on those expedients which have been tentatively adopted so far during the war emergency.

The purpose of this work is the same as that which prompted publication of

the original volume; namely, to provide metalworkers and engineers with the cumulative knowledge of metallurgy gained by the Houghton Research Staff during 78 years of study and operation. It is based on the experience of no one individual, but rather on a compilation of the most valuable experiences of a corps of men not only thoroughly trained in the fundamentals and theory of their profession, but also having the added advantage of many years of practical knowledge of application.

Included in the book is a total of 26 chapters which are headed as follows: The Physics and Chemistry of Metallurgy; Metals and Their Ores; Fuels; Refractories; Non-ferrous Metals; Iron Ores; Manufacture of Iron and Steel; Mechanical Treatment; Temperature Measurement; Heat Treatment of Steel; Quenching; Grain Size and Hardenability; Testing and Inspecting; Metallography; Heat-treating Furnaces; Steels Used for Carburizing; Carburizing Materials; Procedure Control and Equipment; Containers; Selective Case Hardening; General Discussion of Carburizing and Hardening Troubles; Liquid Salt Baths; Heat Treatment of Aluminum Alloys; Steel Classification and Specifications; Service Rendered to the Metal Industry; Reference Data.

Handbook on Designing for Quantity Production. By Herbert Chase. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. 517 pages. Cloth binding, board covers. Price, $5.00.

The purpose of this book is to provide engineers, engineering students, and others interested in design with as much practical information on designing for quantity production as can well be compressed within a volume of this size. The authors of the various chapters are or have been intimately associated with work involving their respective subjects and are ranked as authorities on these subjects.

The book is intended not only for reference by engineers already engaged in design, but also for use by students of engineering who must understand practical considerations relating to production before they can apply the theory of design with optimum economic results. Production men, especially those who are in frequent contact with designers, also can benefit, it is claimed, by using the book to point out how, in specific instances, designers are failing to design for maximum economy.

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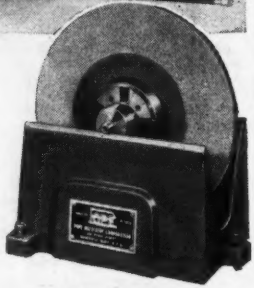
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seven of the chapters constituting Part I. The reasons for each rule are explained, and ample illustrations are included to indicate how the rules are applied. In Part II, various types of products manufactured in quantities at moderate or minimum cost are compared, one against the other. Such comparisons, in many instances, are made with actual production costs.

Chapter headings of the book range as follows: (Part I) Design of Die Castings; Design of Sand Castings for Quantity Production; Design of Screw-Machine Products; Design of Stampings; Design of Die-Forged Parts for Quantity Production; Notes on and Accomplishments in Hot Heading; Notes on the Design of Cold-Headed Parts; Design of Plastic Moldings for Economical Quantity Production; (Part II) Die Cast or Sand?; Permanent-Mold and Die Castings Compared; Which Type of Nonferrous Casting?; Die Cast or Stamped?; Die-Cast or Screw-Machine Products?; Cold-Headed or Screw-Machine Products?; Die Castings and Plastic Moldings Compared.

Essentials of Precision Inspection. By Wesley Mollard. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. 207 pages, 8½ x 11 inches. Cloth binding, board covers. Price, $3.00.

This book is a work manual containing detailed instruction in the use of the various measuring instruments; technical and related information on checking the location of holes, threads, gears, and so on, and the procedures to be followed in checking a piece of work to specifications. Its material is intended to lay the foundation for the development of skill using and applying precision tools and instruments.

Emphasis is placed on the checking of gages and all other tools used in inspection since, obviously, the accuracy of a measurement is no better than the accuracy of the instruments used. All general topics with which the average inspector should be familiar to check required work are covered.

Each chapter contains technical and related information pertaining to the subject matter. The text features problems with outlined procedures to follow, each problem also including a number of questions and an answer sheet. The book is said to be especially suitable for use with the American Machinists' Handbook, to which reference is made in the text.

Chapter headings of "Essentials of Precision Inspection" are as follows: Inspection Tools and Gages; Rules; Micrometer Calipers; Vernier Gages; Checking Holes; Knurling—Carburizing—Sandblasting; Gage Blocks and Attachments; Sine Bar; Milling Cutters—Key Slots; Threads; Problems; Gears.

Time Study Engineering. By William H. Schutt. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. 426 pages. Cloth binding, board covers. Price, $5.00.

Simplified so that it can be easily understood by anyone entirely unfamiliar with shop production methods, the material in this book covers every detailed phase of time study on the basis of specific machine studies. Each time study shown is taken from actual industrial observation. Shop production methods, machinery and tools are completely explained, as well as the step-by-step study that should be taken on particular operations.

Entirely new, simplified explanations of speeds and feeds are contained in the book, and a detailed analysis is given to determining "line tasks" and controlling man power in order to eliminate "bottlenecks." In a pocket inside the back cover are 23 time-study charts. Two other charts appear on pages 30 and 55. These charts will serve to give the reader an understanding of the practical application of the material discussed in the text.

Besides its use for classroom teaching, this book has several other purposes. Time-study engineers can use it as a handbook to assist them in their daily work. And although it is written from the viewpoint of a methods engineer, any supervisor or executive can find in it many suggestions to apply to his own problems. It will also tell the workingman in the shop how time studies are made and figured and why they are used.

"Time Study Engineering" comprises a total of 32 chapters having the following headings: The Time-Study Engineer; Time-Study Equipment; Motion Analysis; Analyzing the Operation and Watch Reading; Decimal Problems; Determination of Task and Price; Efficiency Rating; Studies with Special or Foreign Elements; Studies on Press Operations; Drill Presses; Milling Machines; Lathe Operations; Spot and Projection Welding; Butt Welding; Roll-



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"Hartford Manual on Tool Conservation and Salvage." To meet the need for information and data pertaining to the conservation and salvage of cutting tools and gages, the Hartford Chapter of the American Society of Tool Engineers has prepared a pamphlet to be known as the "Hartford Manual on Tool Conservation and Salvage." The pamphlet describes and explains tested up-to-the-minute methods of tool salvage and is written by experts each in their various fields.

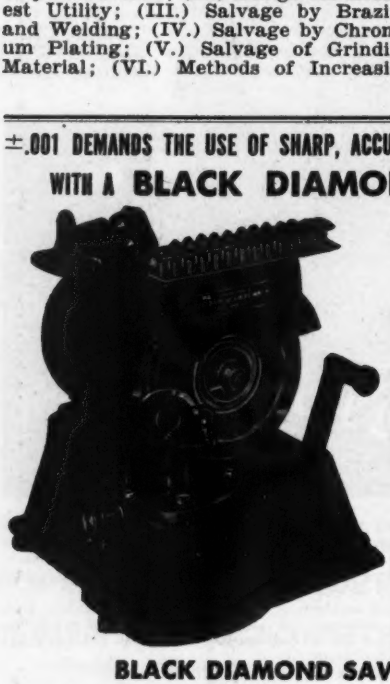
Contents of the pamphlet range as follows: Foreward; (I.) Design for Economy of Material; (II.) Design for Broadest Utility; (III.) Salvage by Brazing and Welding; (IV.) Salvage by Chromium Plating; (V.) Salvage of Grinding Material; (VI.) Methods of Increasing Gage Life; (VII.) Methods of Increasing Tool Life; (VIII.) Kinks and Short Cuts; (IX.) Future Developments; (X.) Recommedations to Management; Glossary.

Copies of the pamphlet are available at a price of 75 cents each by writing to Harry J. Hauck, Committee Secretary, 22 N. Wellington St., New Britain, Conn. Special prices if pamphlet is ordered in lots of 100 or more.

Treatise on Planers. Third edition. Published by The Cincinnati Planer Co., Cincinnati, Ohio. 133 pages. 161 figures. Cloth binding, board covers. Price, $1.00.

This volume is designed to provide apprentices, planer operators, and all those interested in metal planing with information which will aid in the quick and accurate production of flat surfaces. It briefly relates the history of the planer, gives useful data on latest planer design and construction, illustrates and discusses planer tools, setups, special jobs, typical work, and various types of available planers. Special effort has been made to present the text in a clear and comprehensive manner, carefully avoiding all unnecessary matter.

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Diesel Locomotives—Electrical Equipment. By John Draney. Published by American Technical Society, Drexel Ave. at 58th St., Chicago 37, Ill. 388 pages. 235 photographs and drawings. Cloth binding, board covers. Price, $3.75.

Prepared as the result of a need for an instructive text for men desiring to learn how to operate, service, and maintain Diesel locomotives, this book deals in the utmost detail with the electrical equipment of the Diesel engine, with particular reference to its adaptation and use in railway transportation. The book is written in a clear, easy-to-understand manner, well illustrated, thoroughly indexed, and durably bound.

The author has had years of actual experience, having been a locomotive engineer until reaching the retirement age. He is a past president of the United Associations of Railroad Veterans and at present is in charge of the Diesel question and answer department of the Brotherhood of Locomotive Firemen and Enginemen's Magazine. He was assisted in the writing of this book by several men who are associated with railroads and Diesel locomotive manufacturing concerns.

Contents of the book are as follows: Current Electricity; Principles of a Generator; Ohm's Law; Electrical Power Measurements; Transmission Equipment; General Electric Light Weight Diesel Locomotive; Baldwin-Westinghouse Equipment for Switching Locomotives; Electro-Motive Equipment; Alco-G.E. 660 H.P. and 1000 H.P. Diesel-Electric Locomotives; Alco-G.E. Diesel Electric Road Locomotive 2000 H.P. Equipment; Index.

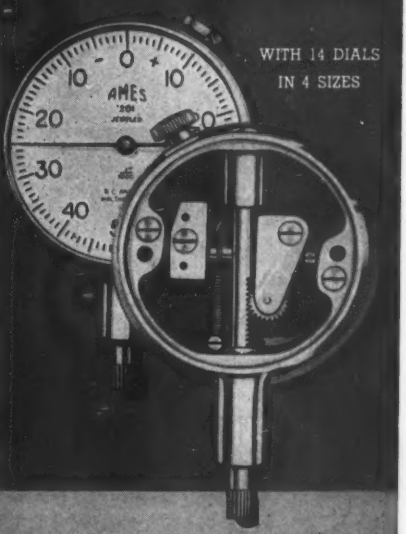
This volume together with the previously announced one on the mechanical equipment of the Diesel engine should go far toward giving the earnest student an exact and expert knowledge of Diesel engineering and Diesel accomplishments.

Hand Tools. By Albert M. Wagener and Harlan R. Arthur. Published by D. Van Nostrand Co., Inc., 250 4th Ave., New York, N. Y. 174 pages. Cloth binding, board covers. Price, $1.75.

For those new workers who are at the beginning of their trades and for the old-timers who are exploring new possibilities for their old skills this guide book to shop tools has been prepared. No attempt to instruct in the use of these tools has been made. The book, rather, is concerned with identifying the quantities of small tools that are used in every factory and shop. A few lines

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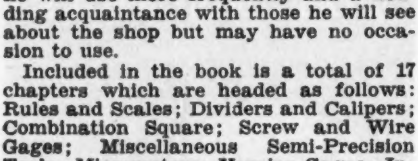
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of explanation, a sketch, and the name are given for each tool to distinguish it from others that are similar in function and appearance. The aim is to give the student an understanding of the tools he will use more frequently and a nodding acquaintance with those he will see about the shop but may have no occasion to use.

Included in the book is a total of 17 chapters which are headed as follows: Rules and Scales; Dividers and Calipers; Combination Square; Screw and Wire Gages; Miscellaneous Semi-Precision Tools; Micrometers; Vernier Gages; Indicators; Specialized Precision Tools; Hand Shaping, Forming, and Marking Tools; Turning and Gripping Tools; Tools for Holding Work at the Bench; Miscellaneous Holding Devices Used at Machines; Hole-Forming Tools; Machine Cutters and Their Holders; Miscellaneous Tools; Types of Fasteners.



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Shop Literature

"Air Tools for Aircraft" is the title of a 12-page catalog issued by Ingersoll-Rand, 11 Broadway, New York 4, N. Y., containing illustrated, descriptive, and tabular information on drills, riveters, grinders, chippers, scalers, wrenches, hoists, and so on. Copy of catalog is available free by requesting Form 5100.

"Match-It" Gear Chuck, a uniquely designed device for holding both helical and spur-tooth gears—either external or internal—for finish boring, facing, counterboring, grinding, and so on, is thoroughly covered in an eight-page illustrated catalog now available free from LeMaire Tool & Mfg. Co., 2659 S. Telegraph Rd., Dearborn, Michigan.

"Interesting Applications of the Cincinnati No. 2 Cutter and Tool Grinder," a 12-page booklet now being offered by Cincinnati Milling and Grinding Machines, Inc., Cincinnati 9, Ohio, comprises two reprinted articles covering advanced methods in cutter sharpening — "Grinding Milling Cutters with Resinoid Bonded Wheels" and "Making Carbide Tipped Flat Boring Cutters." Copy of Booklet No. M-1296 free.

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Cincinnati Hypro Vertical Boring Mills, 54-inch, 64-inch, and 6, 7, and 8-foot sizes, are covered as to available head combinations, coolant systems, construction and safety features, electrical equipment, capacities, and so on, in a 24-page illustrated bulletin released by The Cincinnati Planer Co., Cincinnati 9, Ohio. Copy of Bulletin No. 131 free upon request.

Dynatrol. Sciaky Bros., 4915 W. 67th St., Chicago 38, Ill., now has available a four-page bulletin illustrating and explaining the construction and function of the Dynatrol—a high speed, normally closed, single pole interruptor, the contact points of which are shunted by a bank of capacitors. Copy of Bulletin 201-A free upon request.

Carboloy Bulletin No. GT-174. A 14-page, illustrated, technical bulletin containing detailed information on the high speed milling of steel with cemented carbide tipped cutters has been released by the Carboloy Co., Inc., 1143 E. 8 Mile Ave., Detroit 32, Michigan.

The material presented is based on practical field work together with observations of many jobs in almost every branch of the metal-working industry, thus making the bulletin a useful guide for handling practically every type of milling job involving carbides. Copy of Bulletin No. GT-174 free upon request.

Coolant and Lubricant Pump Engineering Manual. Published by the Pioneer Pump & Mfg. Co., 19679 John R St., Detroit 3, Mich., this 88-page plastic-bound manual is designed as a reference book for machine tool builders and pump users. It tells how to determine the size of pumps, how to make proper pump installations, and includes charts which enable pump users to determine pump capacity requirements.

In addition, the manual describes and illustrates all the pump models made by the company, with many of them photographed in typical applications on operating machines. These include two types of coolant and lubricant pumps—an impeller type known as the Pioneer, and a positive-displacement type known as the Rollway. Copy of manual is available to executives addressing requests on their company letterheads.



Aerco Hydraulic Multi-Grip Milling Machine Chuck is fully illustrated and described in a four-page folder now being offered free by the Aerco Corp., Hollydale, California.

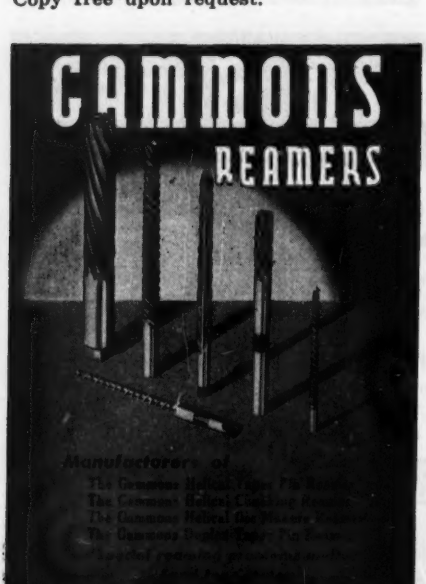
"Truco Diamond Drill Bits" and "Radius Forming Diamond Tools" are the subjects of Booklets Nos. 3 and 4 respectively of the series now being issued by Wheel Trueing Tool Co., 3200 W. Davison Ave., Detroit 6, Mich., covering the complete line of diamond tools manufactured by this firm. Copies of either or both booklets free.

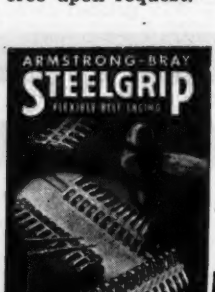
Lima Magnetic Polishing Lathe is the subject of an eight-page engineering and data bulletin released by The Lima Electric Motor Co., 176 Findlay Rd., Lima, Ohio. The bulletin explains in detail the principle of operation of the unit and is illustrated to show the method of application of the magnetic chuck. It also illustrates several different types of faceplate applications for holding work to be polished, burred, or lapped. Copy free upon request.

"Making Them 'Round,'" a 16-page pocket-size booklet illustrating and describing in a very interesting manner the way in which the steel balls used in New Departure ball bearings are made, is now available free from the Advertising Department, New Departure Division, General Motors Corp., Bristol, Connecticut.

"Quality Control" is the title of a 64-page pocket-size handbook on scientific inspection released by Continental Machines, Inc., 1306 S. Washington Ave., Minneapolis 4, Minn. The use of dozens of photographs, diagrams, charts, and tables is said to make the text interesting, absorbing, and informative.

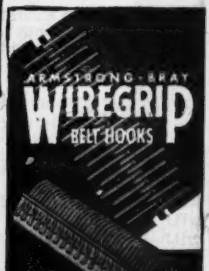
One section of the book highlights 24 subjects vital to precision measuring and explains the use of many precision instruments, including the sine bar, vernier gage, optical flats, and so on. At the end of the book, 53 gage questions together with their answers are given. The various films, charts, and illustrated booklets offered as further training aids on scientific inspection by Continental Machines, Inc. are also briefly treated in the book, copy of which is available free upon request.





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"Operating Information on Stellite 98M2 Cobalt-Chromium-Tungsten Turning and Boring Tools and Milling Cutters" is the title of a booklet now being offered by the Haynes Stellite Co., Kokomo, Indiana.

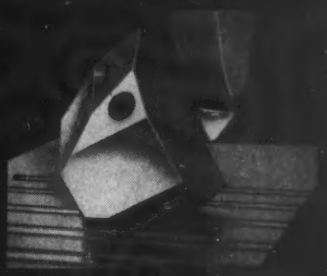
Through drawings, photographs, and charts, this eight-page booklet explains the cutting angles, speeds and feeds, chip-breaker grinds, and grinding wheels that are recommended for use with Stellite 98M2 turning and boring tools and milling cutter blades. Since cutting angles and speeds and feeds depend largely on the material being machined, recommendations are made for machining a number of different metals and alloys. Two chip breaker grinds which have proved popular on Stellite 98M2 tools are illustrated. A chart listing the grinding wheels recommended by 13 different manufacturers is also provided as a guide to selection. Copy of booklet is available free by requesting Form 5350.

Van Keuren Catalog and Handbook No. 32. The Van Keuren Co., 177 Waltham St., Watertown 72, Mass., announces a 144-page catalog and handbook of which 55 pages are devoted to illustrations, specifications, and prices of Van Keuren measuring tools and equipment and 89 pages, to engineering information. Tools and equipment treated include light wave micrometers, taper insert plug gages, wire type plug gages, thread measuring wires, gear measuring wires, hardened steel surface plates, shop triangles, and micrometer lapping equipment.

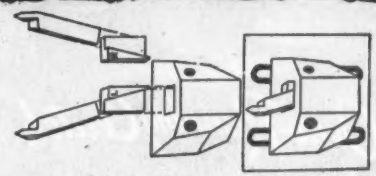
The engineering information presented in the handbook includes formulas for measuring pitch diameters of all important American and foreign threads. Tables of basic diameters for tap drill sizes are given for National Coarse and National Fine threads, and basic dimensions are included on other important American threads.

In addition, the following topics are covered in appendixes: (1) Bureau of Standards measuring wire specifications, (2) methods of measuring and using wires, (3) how to measure helical gears with wires, (4) how to measure angles with measuring wires, (5) how to measure spur gears with measuring wires, (6) how to make flatness tests with optical flats, and (7) notes on gaging holes. Copies of Catalog and Handbook No. 32 are available without charge to executives addressing requests on their company letterheads.

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"'Schultes' Motorization for Brown & Sharpe Universal Grinders," a four-page illustrated folder prepared by the Schultes Tool & Engineering Co., 10318 Shoemaker Ave., Detroit 13, Mich., is now available from this firm free upon request.

"'Die-Less' Duplicating" is the title of a 40-page catalog covering the line of bending, forming, and shearing equipment produced by the O'Neil-Irwin Mfg. Co., 306 8th Ave., S., Minneapolis 15, Minn. In addition to illustrating each particular size bender, brake, and shear, describing its construction, and listing its specifications and applications, the catalog presents illustrations of typical parts produced by each unit as well as illustrations showing manner in which it is operated. A question and answer list rounds out the catalog. Copy of Catalog No. 44-6 free upon request.

"Detroit" Standard Stock Blanks for Thread Milling Cutters. A six-page four-color technical and descriptive bulletin listing over 50 "Detroit" standard blanks for thread milling cutters has been made available by the Detroit Tap & Tool Co., 8432 Butler Ave., Detroit 11, Mich. The sizes and types of blanks listed are for cutters most widely used in industry. All blanks are finish machined, heat treated, spiral fluted, and ground to 5-deg. rake angles. Both shell and shank type blanks with three standard types of tapers are included. Copy of Bulletin No. CB-43 free upon request.

"A New Technique to Greater Profits" is the title of a 20-page bulletin published by The American Tool Works Co., Cincinnati 2, Ohio, describing a method whereby "American" Radial Drills can be used for performing quick and accurate boring operations. This method entails the use of indexing trunnion stands for supporting the jigs through which all boring, drilling, facing, and tapping operations are performed. Prices and dimensions of the two standard sizes in which the trunnion stands are made are presented in the bulletin together with large-size photographs showing the use of these stands in performing a variety of boring operations for the production of "American" Pacemaker Lathes and Hole Wizard Radial Drills and other equipment. Copy of Bulletin 458 free.

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YOU GET EVEN GREATER ACCURACY— FASTER HONING with the IMPROVED SUNNEN PRECISION HONING MACHINE



Sunnen Precision Honing Machine handles any internal diameter from .185" to 2.625" in any metal or plastic except lead and babbitt.

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

A new base, including a pump for providing a constant flow of honing fluid to the honing mandrel and stone. The flow of honing fluid acts as a coolant, carries away cuttings, and keeps the stone in sharp cutting condition. Accuracy and honing speed are considerably improved.

Adequate settling basins and baffles are provided so that no cuttings or abrasive can be pumped into the fluid lines. Flow-back pans are adjustable so that they do not interfere with the work. Pumps and coolant tank capacity are adequate to supply a constant flow of fluid.

In addition, a machine light is furnished for inspecting finish of work and for gaging completed parts.

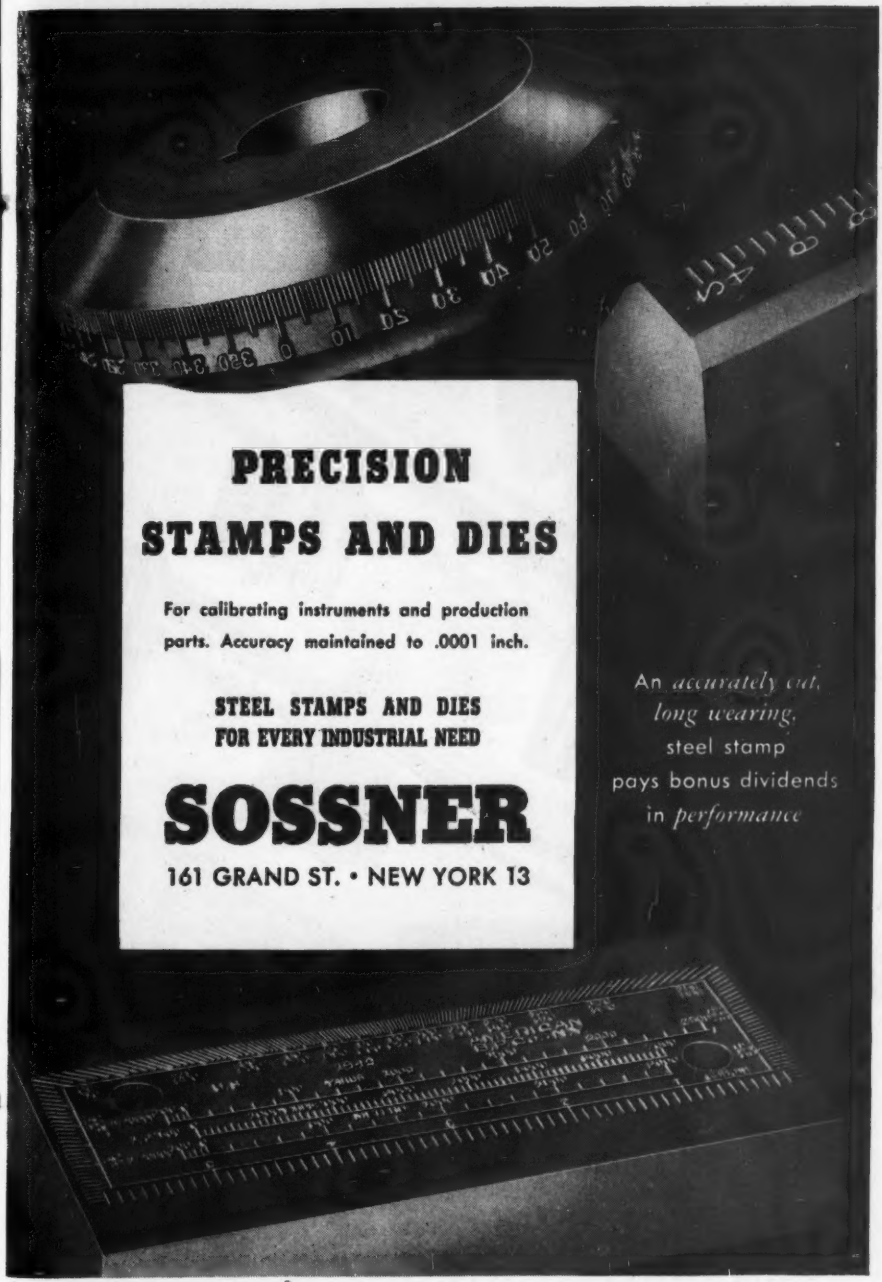
The Sunnen Precision Honing Machine provides absolute interchangeability of parts because tolerances can be held to well within .0001" and produce holes that are honed straight and true without taper or bell-mouth.

Parts last longer because it produces a super-smooth finish of from 2 to 3 micro inches. It's easy to set up and does not require skilled labor for operation.

Write for free bulletin — or ask a Sunnen engineer to give you complete information on how Sunnen honing can be used in your plant.

SUNNEN PRODUCTS COMPANY — 7933 Manchester Avenue, St. Louis, Missouri

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PRECISION
STAMPS AND DIES
For calibrating instruments and production parts. Accuracy maintained to .0001 inch.
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An accurately cut, long wearing, steel stamp pays bonus dividends in performance

ALLOY TIPPED TOOLS



FOR HIGHER SPEEDS

■ Where cutting speeds must be increased to keep pace with modern methods, Scully-Jones and Company standard tungsten carbide and Haynes Stellite tipped tools effect substantial savings by increasing production, giving better finish, longer tool life with less regrinding, and lower cost per unit produced.

Years of experience and engineering knowledge assure correct grades of alloys for your particular job. Our facilities provide prompt and dependable service.

Kindly send drawings or specifications for quotations on special tools.

Scully-Jones AND COMPANY

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NO. 8

CAPACITY
8" x 16" RECTANGULAR
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To maintain metal cut-off PRODUCTION on demand output, and make your QUOTA PLUS . . . To hasten maintenance and repair work, and ELIMINATE COSTLY DELAYS on imperative production . . . Put a WELLS No. 8 to work . . . Built rigid and sturdy, it's portable, too. . . Move a WELLS SAW to the job and SAVE time, SAVE money.

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DEBURR and FINISH by MACHINE



ROTO FINISH
THE STURGIS PRODUCTS CO.
STURGIS • MICHIGAN
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This picture shows two typical parts that are well within the wide work range of mechanical finishing by Roto-Finish. These large castings with their compound surfaces and recessed areas were quickly deburred and finished by this revolutionary new process. It works equally well on steel, brass, aluminum, stainless and nickel steel.

In hundreds of plants, Roto-Finish now makes startling savings in time and costs over hand deburring, grinding, honing and buffing. Precision measurements are held, and far more uniform finishes attained. Send for complete information and let us process samples of your parts . . . without charge.

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GENERAL PURPOSE MARKING MACHINE

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How to determine proper hardness OF SUPERFINISH STONES

While selecting the grade or hardness of a superfinish stone for a given finishing operation the wisest course is to consult a representative of the stone manufacturer. MID-WEST, for instance, maintains a staff of experts to help you with your honing, superfinishing or grinding problems. When, as sometimes happens, that is not possible, here's a simple way to determine whether the stone you are using is of the proper hardness:

Study These Photographs

A



If the stone becomes too black (caused by oxydation of metal on the stone) the stone is *too hard.*

B



If the stone remains too clean, too close to its original color, it is *too soft.*

C

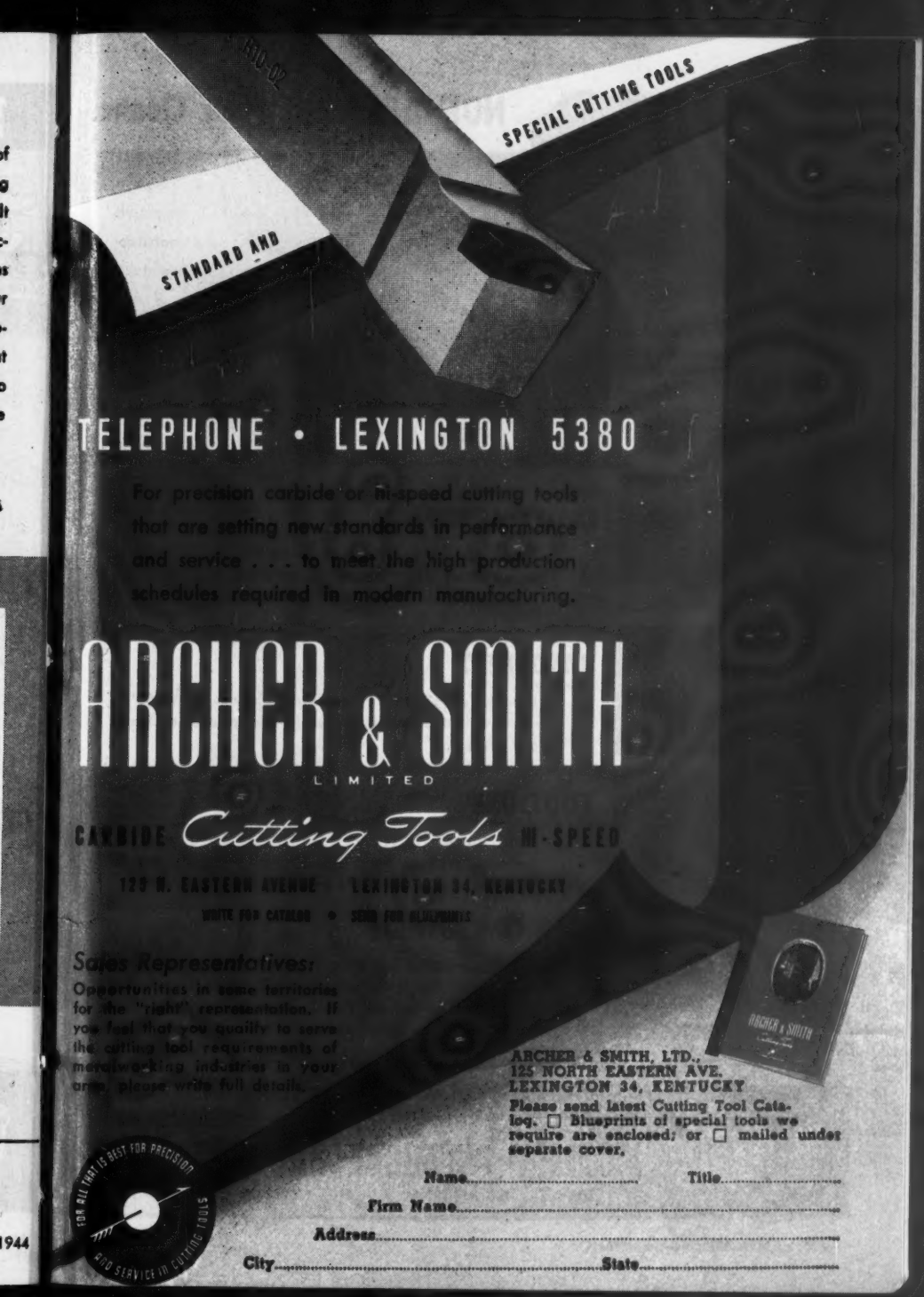


The stone best suited for your job will be a compromise between the two. It will show only a slight discoloration of its cutting surface.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

Owosso, Mich. — 1960 E. Milwaukee Avenue, Detroit 11, Mich. — Rochester, Pa.



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OIL AND GREASE ABSORBENT AND FLOOR CLEANER

NON-ABRASIVE Floor Cleaner



Fidelity Absorbo is composed of sponge-like granules and, because of the absence of any gritty substance, will not mar machine parts or surfaces with which it may come in contact.



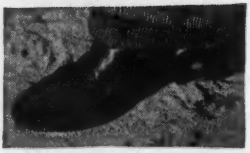
EASILY APPLIED

Simply sprinkle Fidelity Absorbo on the oil-soaked area or on floors where oil spills are likely to occur. The amount may be varied to suit conditions.



ABSORBENT

It soaks up oil and grease accumulations up to 50% of its weight almost immediately, and affords a clean, dry surface.



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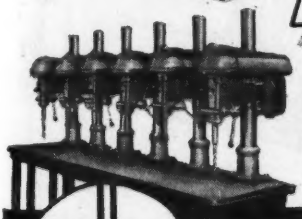
RADIAL DRILLS — Drill to center of 42" circle. Spindle speeds 160 to 8200 r.p.m.

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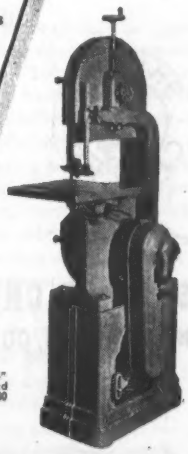
Not a pound, not a horsepower "loafs" in a Walker-Turner Machine Tool. Thoughtful design and careful selection of materials have made them flexible, versatile and stream-lined—yet rugged and accurate. And most of them operate on minimum horsepower requirements.

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BAND SAWS — 14" and 16" models. Speed range from 61 to 5200 s.f.m.

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RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS



Sure Grip---QUICK ACTING

In this Skinner Milling Machine Vise the movable jaw is controlled by a large hardened alloy steel screw. Ample bearings take end thrust. Work holding surfaces are faced with removable hardened and ground steel plates. Vise furnished in 5", 6", 7", and 8" sizes with or without swivel base. Write for catalog giving dimensions and prices.

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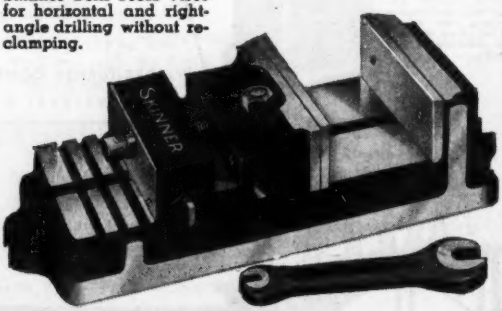
SKINNER CHUCKS

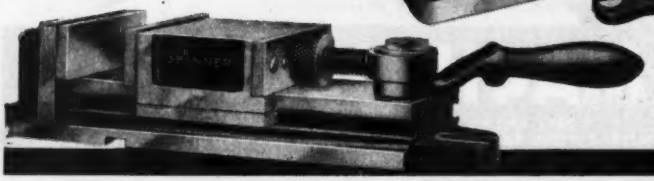
The

SKINNER CHUCK CO.

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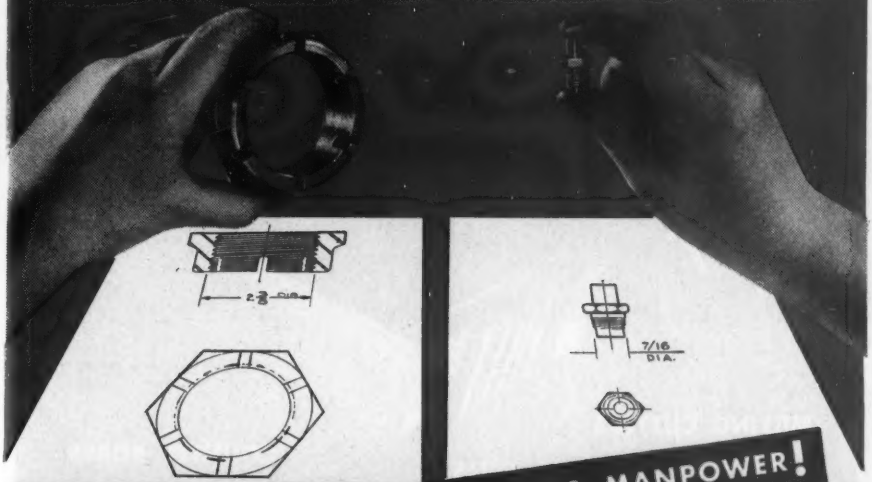
Skinner Drill Press Vises for horizontal and right-angle drilling without re-clamping.





Skinner quick-acting, sure-gripping Milling and Drilling Machine Vise.

Let PLAN-O-MILL do it...



. . . and SAVE MONEY, MATERIALS, MANPOWER!



PUT PLAN-O-MILL to work for you. Replace obsolete, wasteful machines now. The two parts pictured above are now being threaded on the same machine with only a slight tooling change!

Plan-O-Mill does a *better* job of form and thread milling—does it with exceptional speed, accuracy and finish! Consider these advantages:

***Versatile,* handles a wide variety of form and thread milling jobs.**

***Easy to operate,* one operator can handle two or more machines.**

***Semi-automatic,* provides separate and complete control of feed-in and feed-around.**

***Economical,* the part does not revolve, requires relatively small, solid, low cost cutters.**

Find out about Plan-O-Mill today. Contact your dealer or write direct.

THREAD AND FORM MILLING MACHINES — PLAN-O-MILL CORPORATION — 1515 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN — THREAD AND FORM MILLING CUTTERS

for Continued Accuracy

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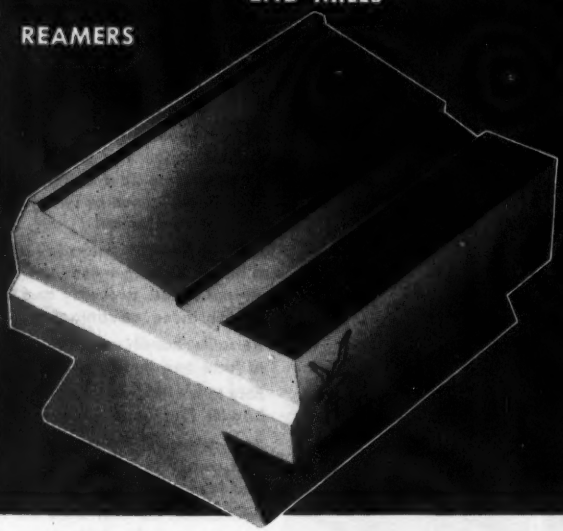
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END MILLS

COUNTER BORES

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SPECIAL TOOLS

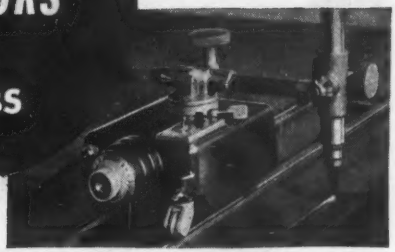


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DETROIT, MICHIGAN

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WE'LL GIVE YOU QUICK ACTION!

SAVE TIME
CONSERVE MAN-HOURS
SPEED ALL THESE METAL-CUTTING JOBS



Cutting a straight line with square edge with the No. 10 Radiagraph.

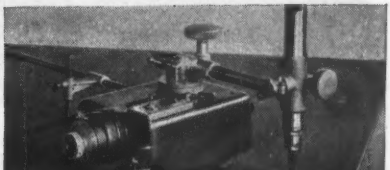
...with an Airco No. 10 Radiagraph gas cutting machine

On many different types of metal-cutting jobs, you save production time, assure accurate cutting, and make most effective use of your manpower with the lightweight portable Airco No. 10 Radiagraph gas cutting machine.

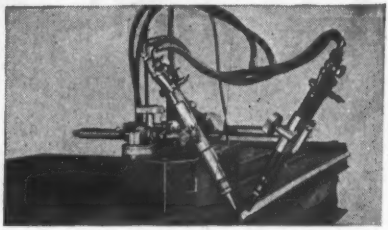
The Radiagraph is motor driven and operates on a track for straight line cutting. One 5 foot track is supplied as standard equipment with each machine. By using two or more tracks dovetailed together progressively, straight cuts of any length may be made.

For cutting arcs and circles a radius rod and center point is furnished with each No. 10 Radiagraph. With these, circles or arcs of 3" to 85" in diameter can be cut with either a square or beveled edge. Circles of larger diameter are cut by using a longer radius rod.

The indexed speed control knob on the No. 10 Radiagraph permits easy setting of any desired cutting speed, from 4" to 45" per minute. Changes in speed may be made while the machine is running.



Circle cutting, showing the standard radius rod and center point supplied with the No. 10 Radiagraph.



No. 10 Radiagraph using two torches for cutting simultaneously a double-bevel on steel plate.

For complete details on the Airco No. 10 Radiagraph, write for Catalog Section ADC-614A. Address Dept. MMS, New York office.

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Whether it's a single or multi-tipped tool, whether or not you have a print of the specific tool you need, Ex-Cell-O can give you exactly what is required in a tungsten carbide application . . . Write for Bulletin No. 11132.

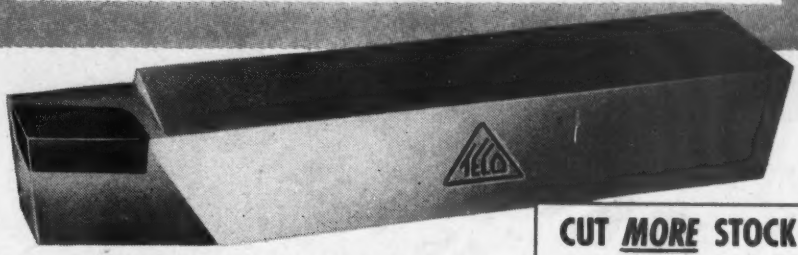
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EX-CELL-O for PRECISION

Precision MACHINE TOOLS • CUTTING TOOLS • AIRCRAFT AND MISCELLANEOUS PARTS



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use TECO *Cemented Carbide!*

War requirements stress the need for peak production; changes in production emphasize the need for low inventories. You accomplish *both* by using TECO Cemented Carbide for turning, boring and facing operations. Each tool stays on the job much longer, produces more pieces, needs fewer replacements. Thus, you raise your production to higher levels, while maintaining low tool inventories.

TECO Cemented Carbide has resistance to wear and breakage in an advanced degree, through controlled hardness, density and uniformity of structure. Comparative job records consistently show sharp increases in production per tool when TECO Cemented Carbide is used—a fact you can prove on your own machines. Write for catalog and new price list covering tools and blanks in a wide range of grades, styles and sizes.

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CARRY *LESS* STOCK HERE



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Are made in two and four flutes and are furnished both for steel cutting and non-ferrous metal cutting.

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These cutters are made of a tough alloy steel body, with brazed Tantung blades. Designed to fit standard arbor equipment.

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More and more, it's service that counts . . .

and *Cities Service* means *good service*!

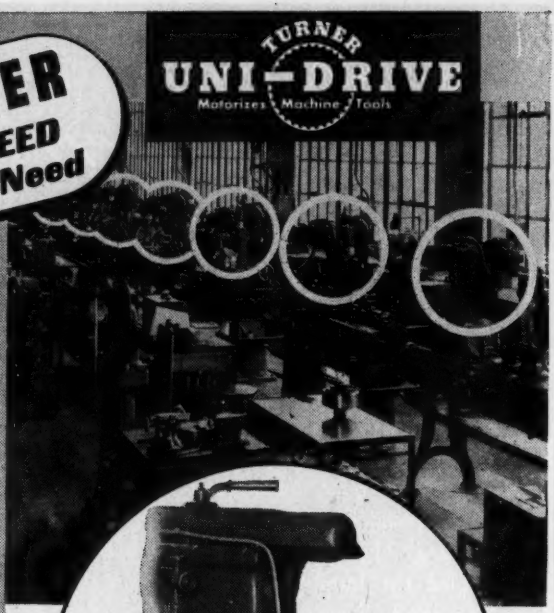
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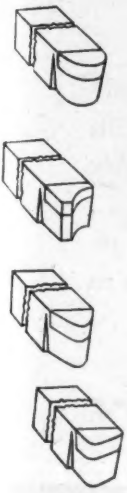
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FOR SPECIAL PURPOSES



...and you'll be sure of a perfect fit



Fitting a carbide tool to the work is a job for specialists—and the skill with which the tool is ground is directly reflected in increased production. Kennametal standard tools will handle the majority of usual metal-cutting jobs, but even if their number were multiplied by ten, there still wouldn't be a sufficient variety. For the tool must be fitted to the work, not the work to the tool.

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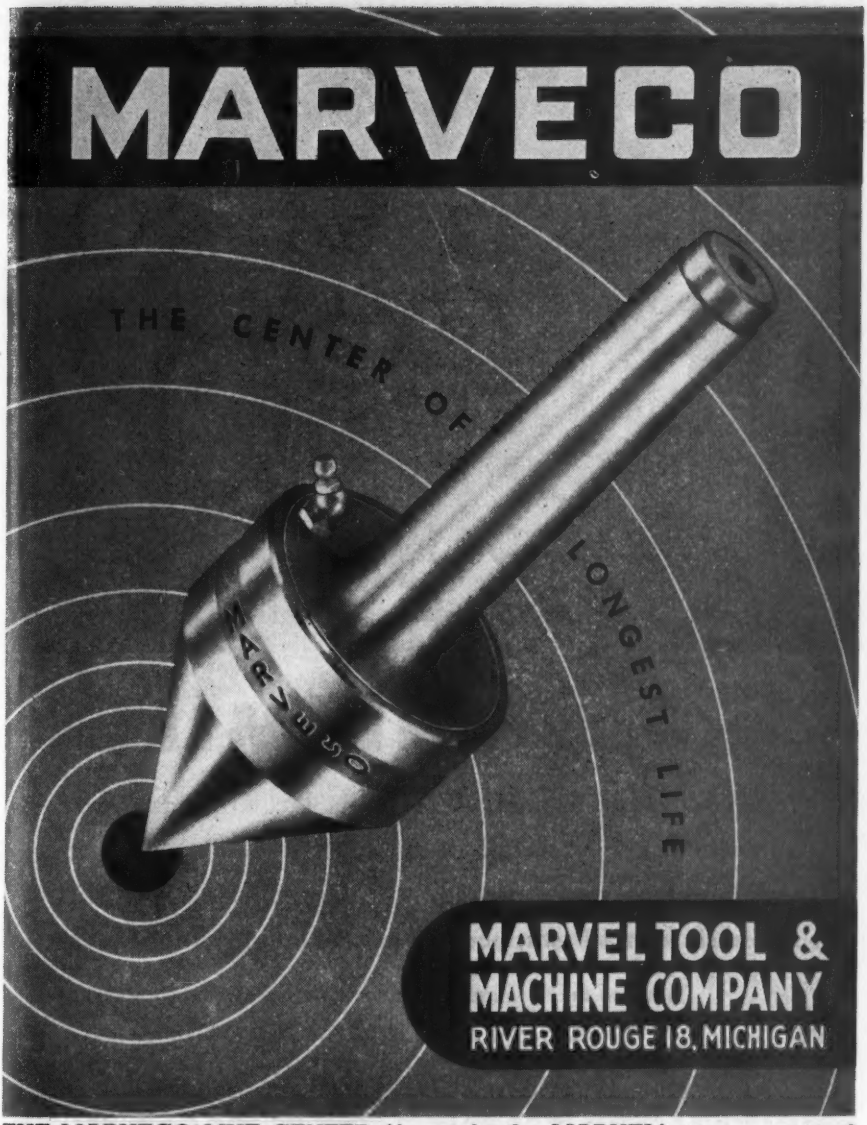
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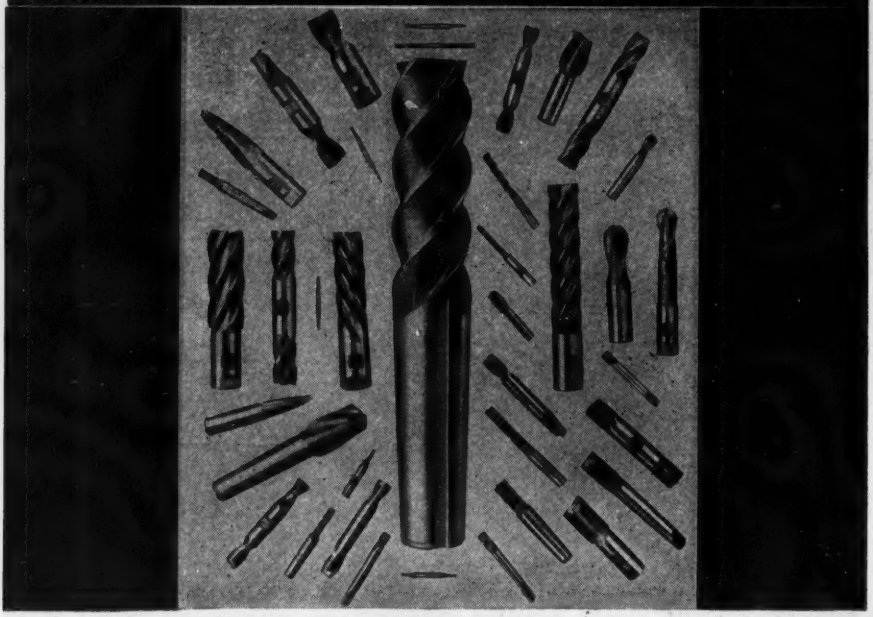
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SEND US YOUR PROBLEMS.

YESTERDAY'S PIONEER . . . TODAY'S LEADER

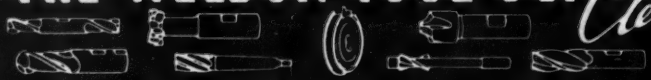


Quality END MILLS

When you think of quality End Mills, large or small, stock or special, always think of WELDON. We are in good shape now to make specials to order. Special End Mills generally can be shipped in approximately four weeks.

We can make immediate shipment of most sizes of WELDON End Mills. **Write for Stock List.**

THE WELDON TOOL CO. *Cleveland 4, Ohio*



3000 WOODHILL ROAD

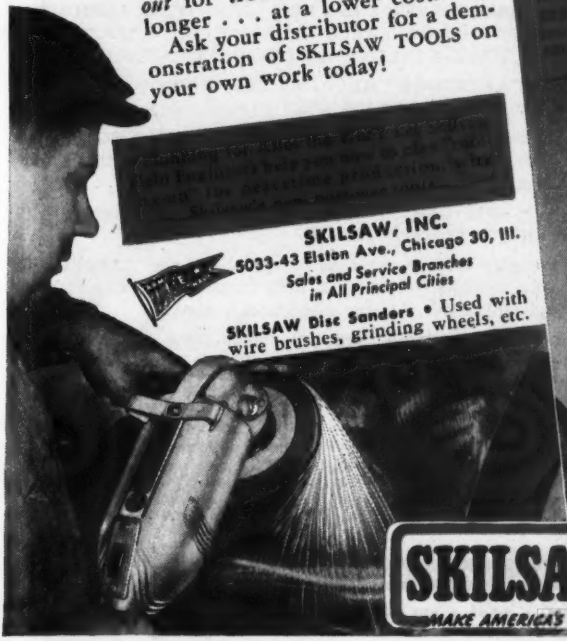
Name your toughest finishing job

THESE SKILSAW TOOLS ... ONE OF will do it FASTER, BETTER, EASIER!

• If your problem is grinding down heavy weld beads or removing heavy burrs ... a SKILSAW Portable Grinder will speed the work. If it's cleaning off spot welds, or polishing curved or flat surfaces of any material ... one of these SKILSAW Disc Sanders or Belt Sanders will do the job better, and easier!

SKILSAW Disc Sanders, Belt Sanders and Portable Grinders, like all SKILSAW TOOLS, are *built to stand the gaff*. They're powered for extra fast work ... streamlined, compact, lighter for easier handling ... and they're *better-built throughout* for trouble-free performance longer ... at a lower cost.

Ask your distributor for a demonstration of SKILSAW TOOLS on your own work today!



SKILSAW, INC.
5033-43 Elston Ave., Chicago 30, Ill.
Sales and Service Branches in All Principal Cities

SKILSAW Disc Sanders • Used with wire brushes, grinding wheels, etc.



SKILSAW PORTABLE ELECTRIC TOOLS
MAKE AMERICA'S HANDS MORE PRODUCTIVE



The life of a motor is no longer than the life of its bearings. And the bearings may fail for any or all of these reasons:—(a) poor design and construction; (b) neglected or poor lubrication; (c) dust and dirt.

MOTOR MANUFACTURERS WHO HAVE ADOPTED NORMA-HOFFMANN "CARTRIDGE" BALL BEARINGS ARE PROVIDING THEIR CUSTOMERS IN-BUILT MOTOR LIFE INSURANCE—IN EFFECT, A GUARANTEE OF LONGER, MORE TROUBLE-FREE, LOWER-COST PERFORMANCE—because:

A. The "CARTRIDGE" BEARING is a NORMA-HOFFMANN PRECISION product, designed EXPRESSLY to meet motor requirements.

B. With double-row width, the "CARTRIDGE" BEARING provides WITHIN ITSELF at least twice the lubricant supply of any other single-row ball bearing.

C. The "CARTRIDGE" BEARING is loaded at the factory with NORMA "STABILITY-TESTED" GREASE.

D. The highly efficient, wearless metal seals of the "CARTRIDGE" BEARING KEEP DUST AND DIRT OUT, AND LUBRICANT IN. And being removable and replaceable, bearing inspection is easy.

These, and other, distinctive features explain why so many motor manufacturers, seeking to assure MAXIMUM MOTOR LIFE, have adopted NORMA-HOFFMANN "CARTRIDGE" BEARINGS FOR THEIR LATEST AND MOST EFFICIENT MODELS.

Ask for motors carrying the "life insurance that NORMA-HOFFMANN "CARTRIDGE" BEARINGS provide. They will be a sound and lasting investment, returning good dividends in lower costs, longer life, and freedom from shutdowns.



NORMA-HOFFMANN BEARINGS CORP'N, STAMFORD, CONN. FOUNDED 1911

TO WIN THE WAR • WORK • FIGHT • BUY WAR BONDS

Give "Green Hands" Blue Flash Performance

Here's help for "newcomers" . . . cut-off wheels that compensate to the fullest possible extent for workers' undeveloped skill . . . wheels that cut clean, free and straight with minimum amount of burr and burn . . . wheels that weather rough treatment.

Train "green help" to recognize features that add finesse to the quality of their work. With Bay State resinoid-bonded, rough-sided cut-off wheels, they get freer cutting action, longer life. Discoloration and heat are minimized because contact surface area is noticeably reduced.

Bay State makes wheels for every type of cut-off machine . . . rubber-bonded wheels for wet operations, resinoid-bonded wheels for dry. Constant rigid laboratory inspection of raw materials . . . modern ovens with delicately-set temperature regulators . . . and other factory refinements contribute to the mounting reputation for leadership of Bay State "Blue Flash" cut-off wheels just as they do for Bay State's complete line including all types of grinding wheels and other molded abrasive products. Bay State's reputation for honing and superfinishing stones is unexcelled.

Test a wheel to see how Bay State quality helps "green hands" and veterans too. For additional details get Bay State's Cut-off Bulletin. Write . . .

BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.



BAY STATE

BLUE FLASH GRINDING WHEELS *FAST and COOL*

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS AND CYLINDERS

ACCURACY & DEPENDABILITY

"Built-In"



ABRASIVE

3-B

SURFACE GRINDER

In excellence of design, workmanship, and materials of construction, the ABRASIVE 3-B is "tops" in surface grinders. To insure perfect alignment and freedom from distortion the bed of this machine is a massive one-piece casting weighing over 1500 lbs. Typical of ABRASIVE quality, the precision spindle of alloy steel, hardened, ground and lapped, is carried in a phosphor bronze box at front, adjustable for wear, and super-precision ball bearings at rear. For accuracy and dependability, specify ABRASIVE 3-B.

ABRASIVE

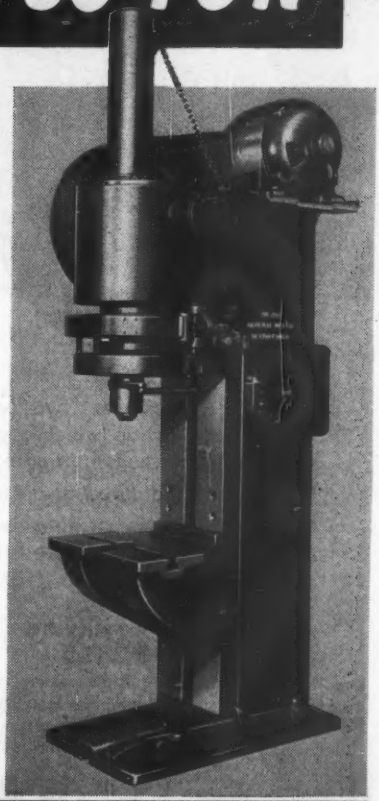
ACCURACY BOOSTS PRODUCTION

SEND FOR DESCRIPTIVE BULLETINS.

ABRASIVE MACHINE TOOL CO., East Providence 14, R. I. • Dealers in Principal Cities

New No. 256 GENERAL FLEXIBLE POWER PRESS - 30 TON

INCREASED CAPACITY
GREATER RIGIDITY
MODERN DESIGN



Modern streamlined design—all mechanism is housed and protected. Box column construction provides greater strength and rigidity—more capacity.

This semi-automatic, power-driven press provides momentary pressure up to 35 tons for straightening, bending and similar operations.

Operated by foot pedal—stroke and pressure are variable—under instant and complete control by operator. Ram returns instantly when pedal pressure is released.

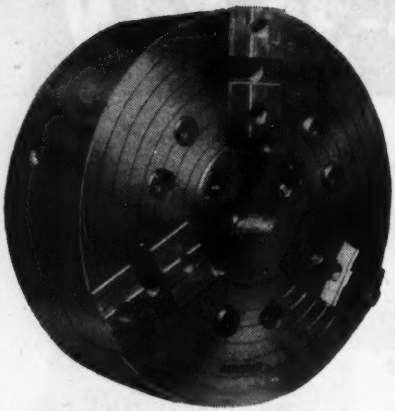
Other General Presses have capacities 3 to 60 tons—write for bulletin.

GENERAL MANUFACTURING COMPANY
6438 Farnsworth Ave., Detroit 11, Mich.

GENERAL *Flexible* POWER PRESS

ZOOM PRODUCTION!
SLASH COSTS!

with "Airgrip" Double-Action Devices



"AIRGRIP" CHUCKS

YOUR judgment will be *doubly* vindicated when you invest in "Airgrip" Chucks — (1) *Immediately,* because your output records will rise — 25% and more — and your manpower problem will be eased; (2) *Later On,* because the unit-cost-cutting achieved with these improved, lathe-modernizing chucks will enable you to meet returning competition.

"Airgrip" Chucks offer "two-fisted" *double gripping power* because of the cam's *wedge action* (which operates in *both* directions) and locks the jaws mechanically, whether gripping internally or externally.

Work is held tight even if air supply is cut off completely.

Both the two-jaw and three-jaw "Airgrip" Universal Chucks permit using heavier cuts and coarser feeds to the very limit of the machine's power and cutting-tool endurance.

"AIRGRIP" Revolving AIR CYLINDERS

Double-acting ball-bearing, high-speed revolving air cylinder; maximum life, minimum maintenance. No manual adjustments required. Wear automatically taken up by air pressure within cylinder.

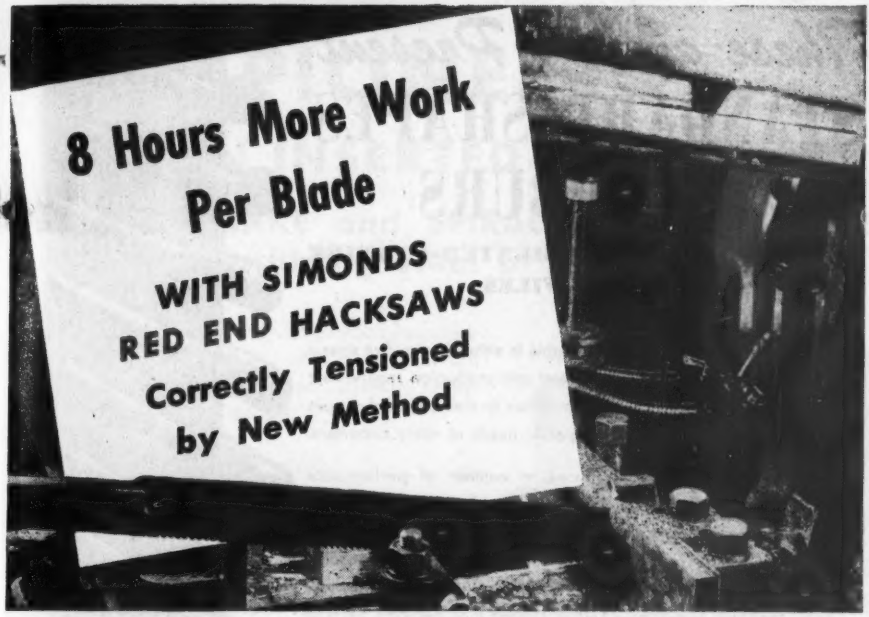
HI-PO Supercharged HYDRAULIC PRESSURE PUMPS

3000 lb.-Pressure Pump, driven by a ½ h.p. motor! Double-Pressure Production; a low-pressure section supercharges a high-pressure section. Builds up pressure fast, with minimum pulsation.

Write us for Bulletin, and consult Anker-Holth Engineers on pneumatic or hydraulic applications.

Anker-Holth Mfg. Co.

332 S. Michigan Ave. Chicago 4, Ill.



In cutting stainless steel bars, one plant could get only about 9 hours from a hacksaw blade . . . and many cuts were concaved because of incorrect blade-tension. Then a *Red End* Blade was put in the same machine . . . , *correctly tensioned by Simonds' new technique* . . . and delivered 17 hours of straight, smooth cutting, *almost double the former blade-life.*

You can get comparable results on *your own* power hacksawing operations. Have your Industrial Supply Distributor bring a Simonds engineer to demonstrate this new tensioning technique right on your own machines. Get in touch *now* with your distributor, or with the nearest Simonds branch office.

Shorten the War . . . BUY BONDS!

1350 Columbia Rd., Boston 27 • 127 S. Green St., Chicago 7 • 228 First Ave., San Francisco 5 • 311 S.W. First Ave., Portland 4, Ore. • 520 First Ave. So., Seattle 4, Wn.

SIMONDS
SAW AND STEEL COMPANY
FITCHBURG, MASSACHUSETTS

PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

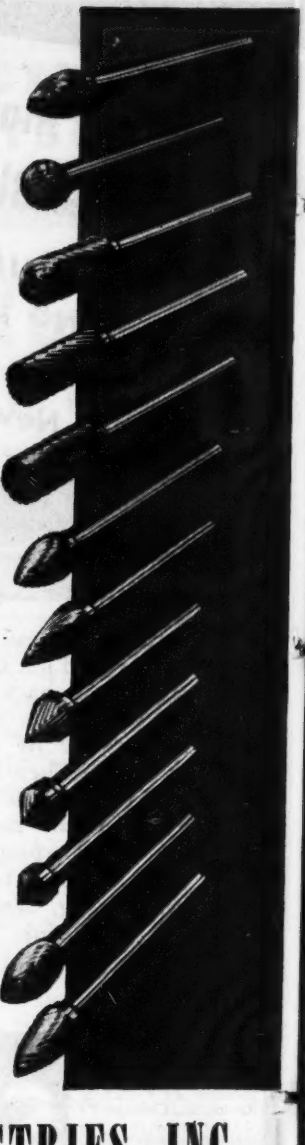
These are the Present STANDARD SHAPES of CARBURS

INDUSTRY'S FIRST CEMENTED-CARBIDE ROTARY FILES

EACH of the tools illustrated is available in either four or five sizes—providing a range that meets almost any production requirement for deburring, filing or cutting. In addition to these, special shapes are being produced to meet the specific needs of many customers.

Since Carburs were first introduced, a number of performance reports have been received from the plants where they have been in constant use. These reports prove that these rotary files—which have teeth ground from the solid cemented-carbide—are providing up to 100 times greater life than high speed steel files. They are greatly reducing deburring, filing or cutting time per part because of the higher speeds at which they can be run and the less frequent need for replacement. Another important feature noted is that tool sharpening is reduced in proportion to the life of the tool.

You, too, will recognize these and other advantages once you have used Carburs in your production. Prompt delivery on all standard shapes and sizes can now be promised. Let us send you full information.



LINCOLN PARK—WHERE THE *"Impossible"* IN PRECISION IS ACHIEVED

ARMY (E) NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1733 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

PIONEERS

IN INSERTED-BLADE

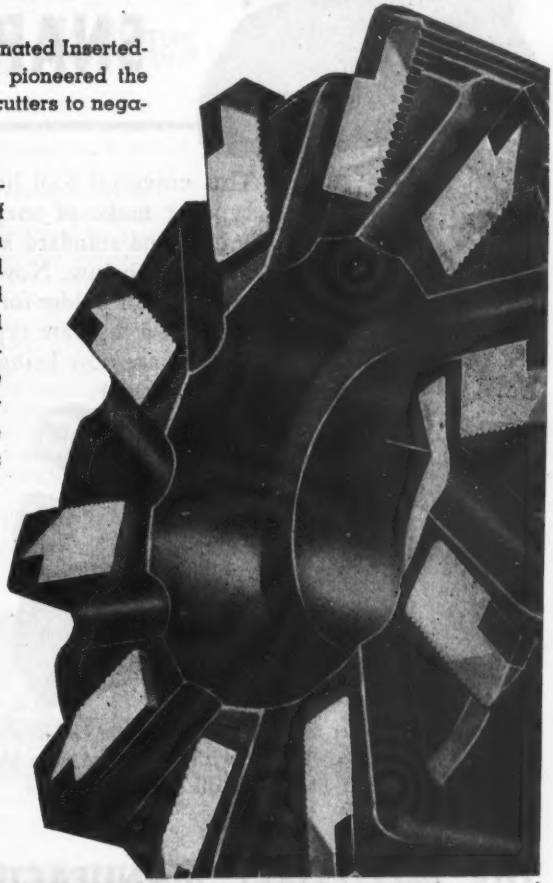
NEGATIVE RAKE *and* SPIRAL MILLING CUTTERS for Machining Steel at High Speeds

The O K Tool Co. not only originated Inserted-Blade Milling Cutters but also pioneered the successful adaptation of these cutters to negative rake and spiral milling.

This type of milling, a "shearing" cut from rear to point of blade which leaves a high finish on steel, requires extra rugged construction both in cutter and set-up. Extreme strength and rigidity are outstanding characteristics of O K Inserted-Blade Milling Cutters, due to the very high grade material and to the effective locking mechanisms employed.

•

In O K Milling Cutters, the blades are separate cutting units; the bodies are of drop-forged steel. The blades are held securely in mating serrations — always easy to adjust or renew. No pins, no set-screws, no wedges. Made in a wide variety of styles and sizes for all types of metal cutting machines.



INSERTED-BLADE METAL CUTTING

TRADE OK MARK TOOL SYSTEM

MANUFACTURED ONLY BY THE O K TOOL COMPANY, SHELTON, CONN., U. S. A.



NEW!

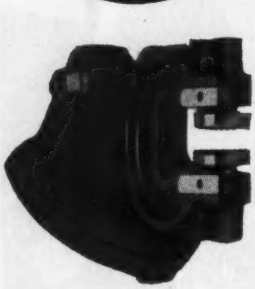
TAFT-PEIRCE TOOL HOLDER

for all types and makes of

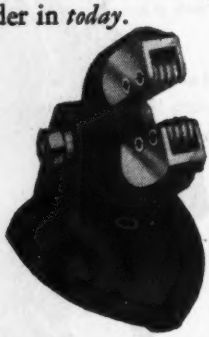
SNAP GAGES

Delivered from stock at $6.50 each

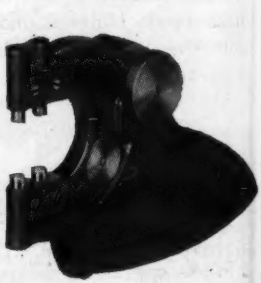
This universal tool holder will accommodate any type or make of snap gage, including all AGD frames and standard adjustable thread snap styles, as shown below. Now you can standardize on one type of tool holder for all snap gage operations, instead of a separate type for each gage. Prompt deliveries are now being made from stock. Get your order in *today*.



Universal Tool Holder used with Taft-Peirce Style 9432 Adjustable Thread Snap Gage.



Universal Tool Holder used with Taft-Peirce Style 9435 Roll Thread Snap Gage.



Universal Tool Holder used with Taft-Peirce Style 9033 Plain Adjustable Snap Gage (AGD Model A).

THE TAFT-PEIRCE MANUFACTURING COMPANY

WOONSOCKET RHODE ISLAND

A WIDER RANGE OF TAP SIZES

WITH

Procunier Tapping Machines



These advanced design tapping machines offer you many definite advantages. For instance, the unit here illustrated handles from No. 2 tap up to 5/16" in steel, ⅜" in cast iron, ½" in brass or aluminum—by interchanging two tapping heads. During rapidly changing production conditions, this flexibility is extremely important. Other Procunier advantages include: 1. The improved Procunier tapping head with double-cone cork-face friction clutch and other exclusive features; 2. Four speeds, ranging from 390 to 2050 RPM, efficiently handle jobs for which conventional high speed tapping machines are inadequate; 3. Extra long Spiral Compensating Springs conveniently located, with wide range hand screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF OPERATOR.

Send for Special Bulletin

giving full details and prices on the full line of Procunier Universal Tapping Machines, Procunier Precision Tapping Heads and the new Tru-Grip Tap Holder.

PROCUNIER

For Faster, More Accurate Tapping

THE PROCUNIER SAFETY CHUCK CO.,
12 S. Clinton St., Chicago 6

Send me bulletins on: ☐ Universal Tapping Machines, ☐ High Speed Tapping Heads, ☐ Tru-Grip Tap Holders.

Name .....

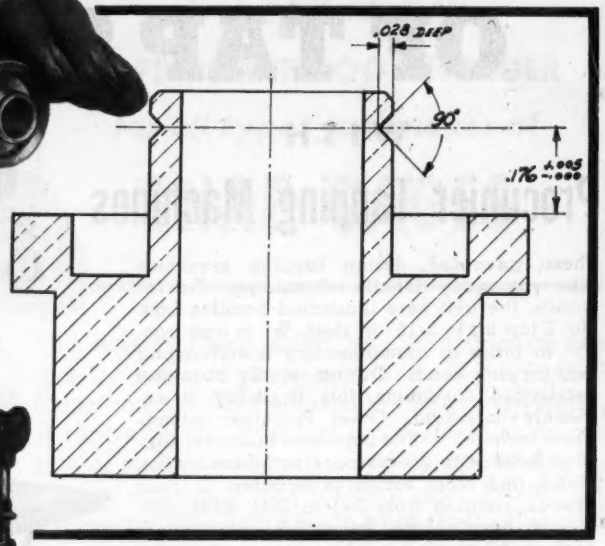
Address .....

City..... State.....

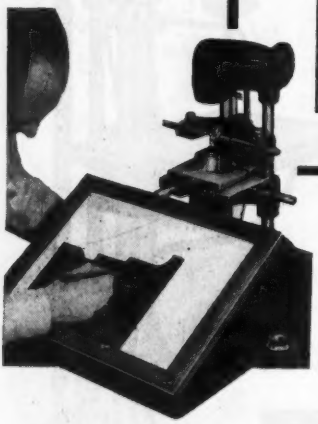
MAIL THIS COUPON TODAY

This part is inspected in SECONDS . . .





Checking a circular form tool on the WILDER PROJECTOR



on the WILDER PROJECTOR

The part shown here is typical of the wide variety of work that can be checked on the WILDER PROJECTOR. In this specific case, three dimensions including an angle can be inspected in one operation. The work piece is quickly located on a simple fixture and checked against a drawing. Errors, 12½ times magnified, show up on the screen in front of the operator.

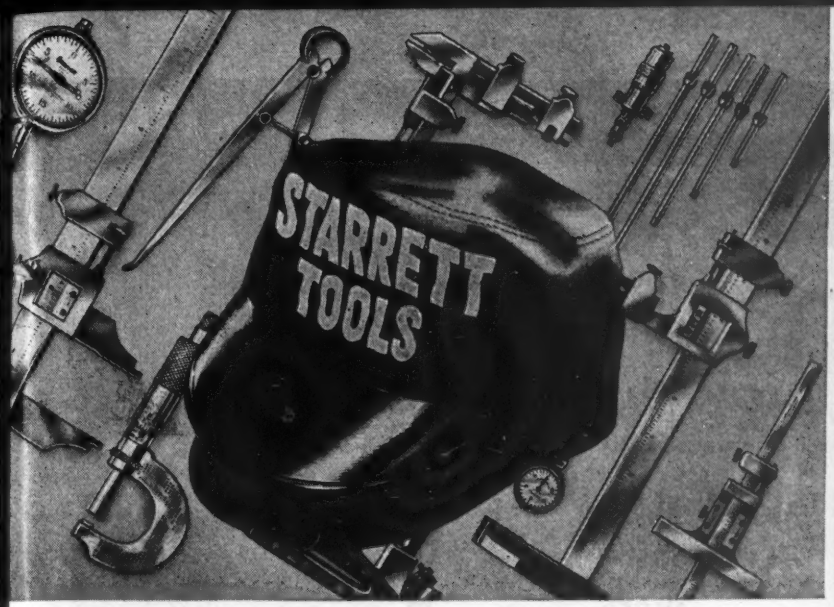
The WILDER PROJECTOR has many applications in every machine shop and plant and is a great time-saver as an optical precision checker on work of all kinds.

Advantages and Typical Application in Inspection

1. **It makes possible faster and more positive inspection by eliminating the uncertain human element of "feel."**
2. **It enables you to see exactly on a greatly enlarged image where tools, templates, gages, as well as parts in process vary from specified dimensions or contours.**
3. **And when you see exactly where and how much the errors are, it is easy to correct them, before they get into production.**
4. **It enables you to verify machine settings by quickly checking the first few parts, thus avoiding rejects.**
5. **It facilitates the control of tool wear through periodic inspection of parts in process.**
6. **It is ideally suited for 100% inspection of the finished parts, where perfect interchangeability in assembly is required.**

WRITE AT ONCE for NEW folder describing the uses of the WILDER PROJECTOR. You'll find several applications covered in this folder that suggest practical ways and means of reducing your measuring and inspecting time and eliminating complicated time-consuming methods.

GEORGE SCHERR COMPANY, INC. 130 LAFAYETTE ST., NEW YORK 13, N. Y.



OUR HAT IS OFF TO DISTRIBUTORS OF STARRETT TOOLS

For a Job Well Done

You don't need to be reminded of the demand for Starrett precision measuring tools, so heavily depended upon for swift, accurate mass production of war machinery and equipment.

Getting these tools into hands that can use them where they count most for victory has been the difficult, and often thankless, task of the mill supply distributor. Without his patient, untiring and consistent cooperation, that objective would have proved far more difficult to achieve.

The L. S. Starrett Company wishes to express sincere and heartfelt appreciation of the loyal and effective services that have been and continue to be rendered by the suppliers of Starrett Tools.

You can count on your STARRETT distributor for dependable assistance on all tool procurement problems—until the last gun is fired, and beyond, for the great re-tooling job of postwar industry.

THE L. S. STARRETT CO · ATHOL · MASSACHUSETTS · U. S. A.

World's Greatest Toolmakers

Now, with Service Star

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

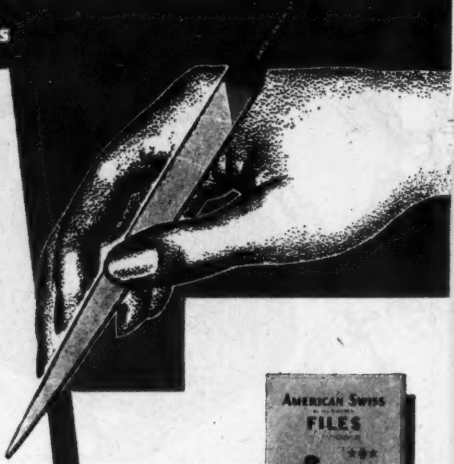
STARRETT TOOLS

"AMERICAN SWISS" Swiss-Pattern FILES

write their own testimonials

"Our experience has shown that AMERICAN SWISS Swiss-Pattern Files last at least 25% longer than others."

At the plant of a metal specialty manufacturer.



CATALOG ON REQUEST



Long life in a file is the result of tough, strong metal . . . correct and uniform hardness . . . sharp, accurately cut teeth . . . long filing surface. All these features are characteristic of AMERICAN SWISS Files... as proven by their popularity for almost 45 years.

AMERICAN SWISS Swiss-Pattern Files have always been made to only one standard . . . the best. There are no "second-quality" AMERICAN SWISS Files . . . each one you buy is guaranteed to be perfect in every respect. These precision tools are made by long-experienced specialists, to exacting standards, and with automatic controls and close tolerances.

These are some of the reasons why it will pay you to standardize on the large line of AMERICAN SWISS Files for all your precision and intricate filing work. Our Distributor can supply you.

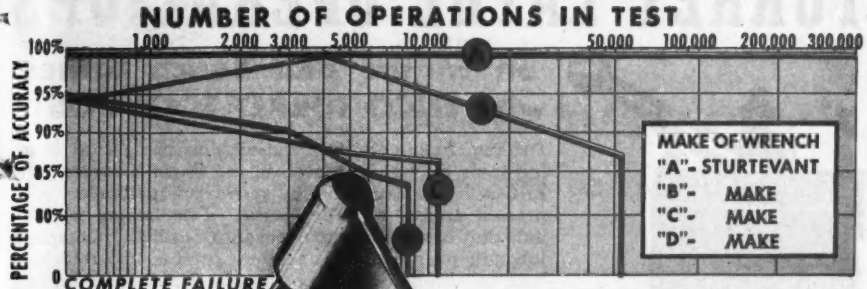
American Swiss File & Tool Co.

Elizabeth • New Jersey

ASK FOR THEM BY NAME

American Swiss ★✚★

SWISS PATTERN FILES



Permanently Accurate

STURTEVANT QUALITY

300,000 Deflections

--- and Still Accurate

Torque Wrenches

As in any other measuring, limiting and inspecting tools, the first requisite of a torque wrench is accuracy. This accuracy should be permanent for few indeed are the users who have means of periodically checking the accuracy of a torque wrench.

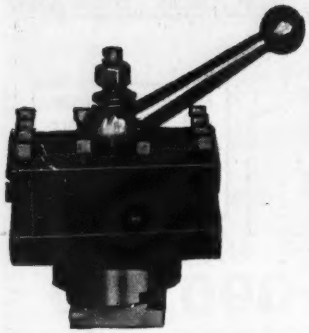
STURTEVANT TORQUE WRENCHES are *inherently accurate* because they use the entire beam of the wrench as the measuring element and readings are direct — not through gears, levers or other error-compounding mechanisms. They will give years of service because the beam is ground to uniformly spread operating stress along its entire length, and all deflection is well within its elastic limits. They are practically *indestructible*, and can be handled like any other tool, on the bench, in the tool box, etc.—have no fragile dials, delicate springs or wearing parts. That is why the majority of Torque Wrenches in use today are STURTEVANT TORQUE WRENCHES.

Write for Bulletin TW-18

Over 100 models and types with capacities from 0-40 inch ounces to 7200 inch lbs.

PA STURTEVANT CO
ADDISON QUALITY ILLINOIS

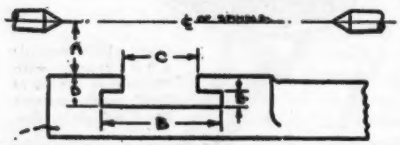
TURRET LATHE OPERATIONS



on Engine and Bench Lathes with ENCO TURRET TOOL POSTS

Turning, facing, boring, cut-off, threading and forming tools may be mounted in the turret block of your ENCO Turret Tool Post to speed production on your present engine or bench lathe. Fast action, positive indexing brings the next tool into position. Complete job can be set up at one time saving valuable lost-time on second operation set-ups. Turret keeps setting accurately. All models mount standard rectangular or square bits as well as standard cut-off blades and boring bars.

"A" Dimension range (from diagram on this page)	Model 6-S	Model 4-S	Model 3½-S	Model 2½-S	Model H
	2"—3-1/8"	1-9/16"—2-1/2"	1-1/8"—1-3/4"	7/8"—1-5/16"	7/8"—1-5/16"
Lathe Swing	16" swing & up	13" to 16" swing	10" to 13" swing	Bench Lathe	Bench Lathe
Maximum tool bit size	1" or 1-1/4" 1-3/8" toolholder for 3/8" bit (Where no tool bit size is specified, turret will be furnished for 1 inch tool bit)	3/4" or 5/8" (Where no tool bit size is specified, turret will be furnished for 5-8 inch tool bit)	1/2" Sq.	3/8" Sq.	3/8" Sq.
SPECIFICATIONS	4 tool 12 position 6" square Packed in carton Shipping Weight 35 pounds **Price . $99.00**	4 tool 12 position 4" square Packed in carton Shipping Weight 12 pounds **Price . $49.50**	4 tool 12 position 3-1/2" square Packed in carton Shipping Weight 8 pounds **Price . $35.00**	4 tool 12 position 2-1/2" square Packed in carton Shipping Weight 4 pounds **Price . $23.00**	6 tool 12 position 3" Hex Packed in carton Shipping Weight 4 pounds **Price . $25.00**



Make of Lathe and Size	A	B	C	D	E	Maximum tool size desired

One-week delivery on ENCO Turret Tool Posts made to specifications. When ordering, furnish all required dimensions and tool size desired.

- **12 position indexing**
- **3 positions for each tool**
- **Carburized hardened steel construction**
- **Mounts rigidly in compound T-slot**
- **Keeps setting accurately**
- **Indexing is self-contained. Eliminates all chip interference**

IMMEDIATE DELIVERY

on Turrets for these lathes:

Atlas • South Bend • Logan

Sheldon • Clausing

Also all models with semi-soft base on center post for quick adaption to your lathe.

Better dealers everywhere carry complete stocks of ENCO Turret Tool Posts and ENCO Tailstock Turrets. However, if your dealer does not carry them, send your order and specifications direct to the Chicago or New York offices listed below.

ENCO MANUFACTURING COMPANY, Dept. 6

General Office and Factory:
3321-23 MONTROSE AVE., CHICAGO 18, ILL.

Eastern Sales Office: (Complete stocks carried)
118 E. 28th ST., NEW YORK 16, N. Y.



The Star is for Continued Outstanding Performance.

WE **USE** 'EM

AFTER WE **BUILD** 'EM

SO THEY GOTTA BE **RIGHT!**

LEMPCO

DESIGNERS • BUILDERS • USERS
OF
PRODUCTION - PROVED MACHINES

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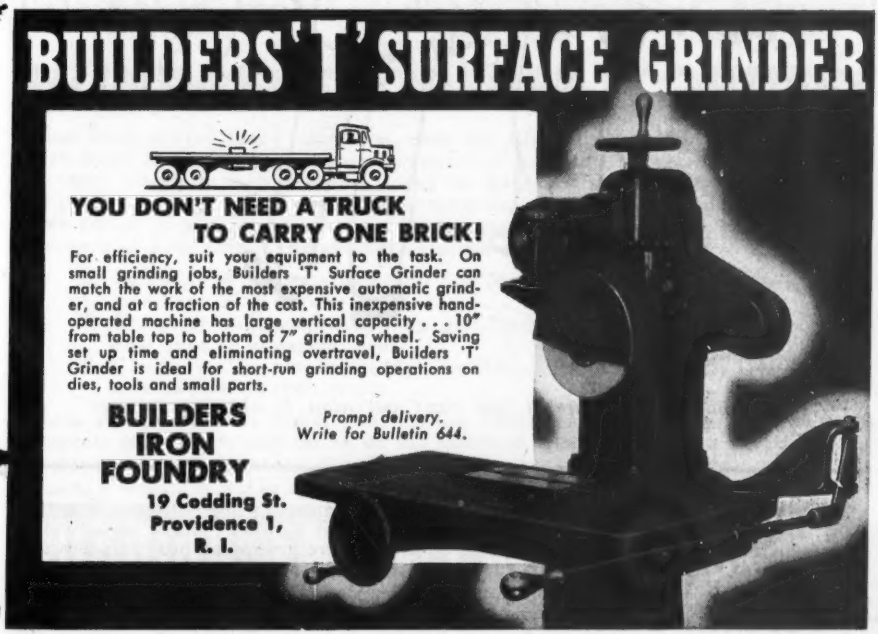
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The Last Word . . .

IT WAS inevitable that the granting of portal-to-portal pay to the mineworkers should start something. Now come the lumber workers with a similar demand, and this undoubtedly will be followed by similar demands from workers in other industries. Portal-to-portal; time-clock-to-time-clock, and so on—all of which will mean either an increase in pay or a decrease in production. The net result will be the same to the employer—an increase in his costs of operation.

Taking advantage of the shortage of labor due to the war situation, in many plants it has become the custom in late years for the workers to change their clothes and wash up on their employers' time. Between periodic demands for wage increases and an increasing tendency on the part of the workers to limit production by taking time out for personal and non-productive activities, it is becoming impossible for a manufacturer to figure his costs accurately. And it is upon these costs that the manufacturer predicates his selling price, and therefore upon these costs depends his ability to continue in business.

The shortage of labor has provided an opportunity which unions were quick to grab to obtain wage increases for their members. These increased wages were used to bid up the prices on the commodities still available in a restricted market, and thus the cost of living was forced up. Other workers demanded increased wages to meet these rising costs, and they, in turn, had their share in continuing the spiral of rising prices. And thus the vicious circle has continued, until now the country is fairly into the fringe of inflation. If allowed to continue, this inflation will mean the ruination of life insurance policies, bank savings, social security, and the country in general.

There must be a limit somewhere on the demand for increased wages, but regardless of where that limit is placed, it must buy an honest equivalent of productive labor. Before a manufacturer can set a price on his product he must know his costs, and before he can intelligently figure his costs he must have a definite understanding as to the amount of production he is to receive for the wage he pays out.

Among the four freedoms set up by the President as the structure for happy living is "freedom from want." To the vast majority, that "freedom from want" is based on an assurance of continuous employment. Continuous employment depends upon the ability of the employer to market his goods at a price which will enable him both to meet competition and to make enough profit so that he can be assured of continuation in business. And the employer can have no such assurance when his manufacturing costs vary from day to day with the whims of the workers in his plant.

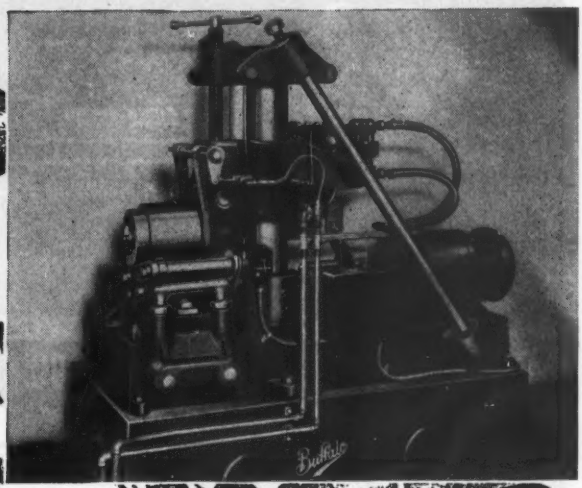
Actually there is only one answer to the problem—a wage payment system based upon a given amount of wage for a task accomplished or per unit produced. The use of such a method of payment eliminates the possibility of argument concerning portal-to-portal compensation, work slow-downs, stalling on the job, and so on.

In fact, it is the only efficient method of paying production workers. The manufacturer buys his raw materials on a unit basis; he sells his product by the unit, and the transportation of that unit is paid for on a bulk or weight-mileage basis. It is just as reasonable to pay for the individual operations which enter into the manufacture of that unit on the same basis, thus giving the manufacturer definite costs per unit completed.

Practically every task that is performed by manual labor, from sweeping a floor to assembling an engine, can be rated on an incentive basis. It should be done by a trained industrial engineer, but it can be done. And the quicker this method is adopted by the individual manufacturer, the quicker he will begin to discover whether he will be able to continue in business in the post-war world.

Howard Campbell

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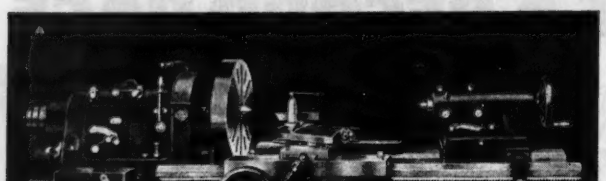
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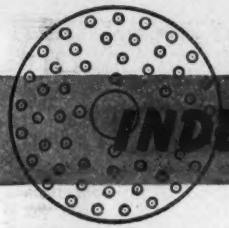
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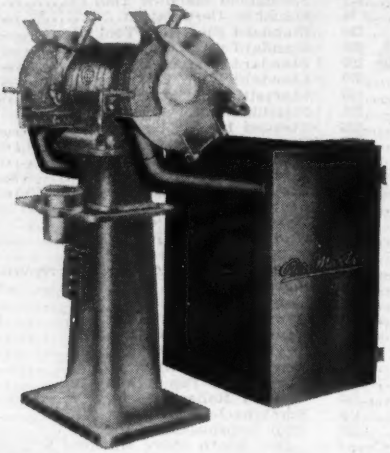


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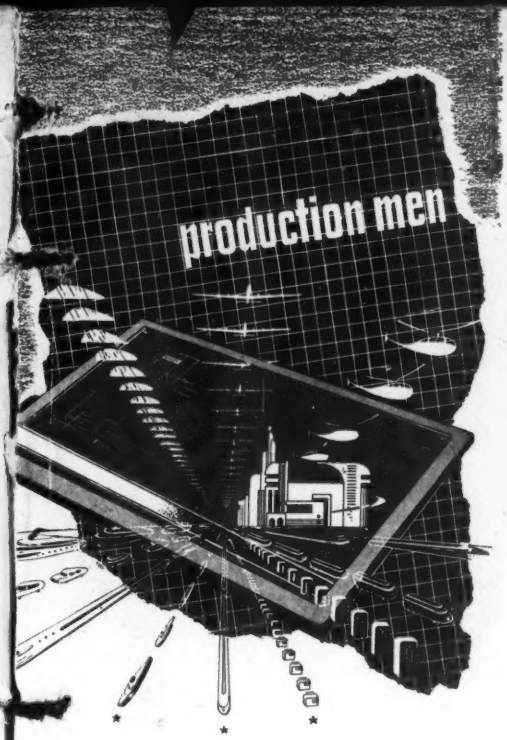
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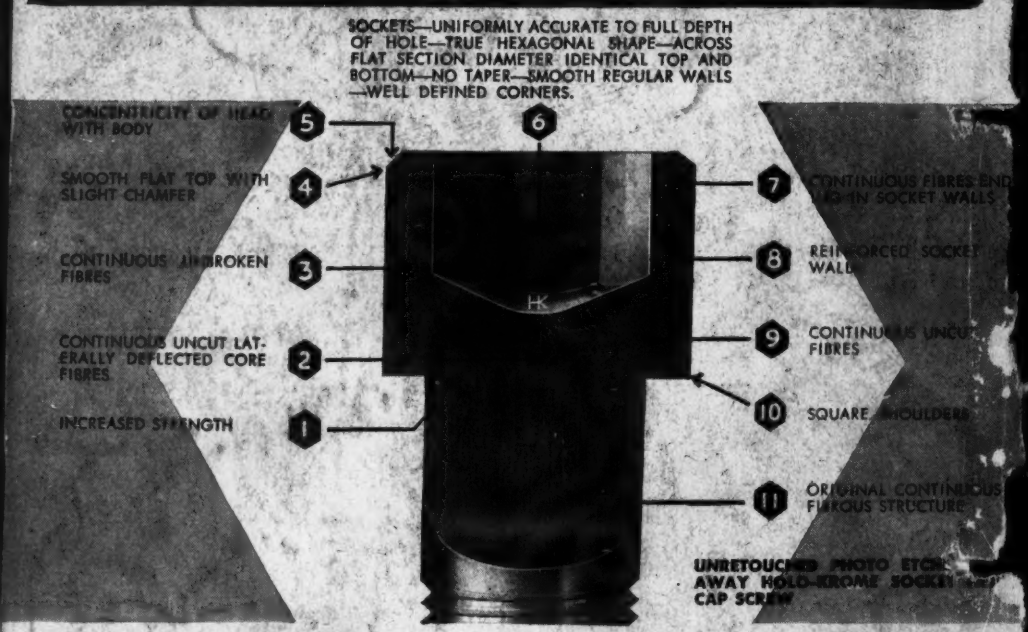
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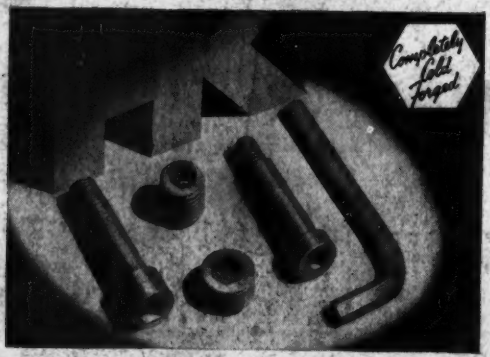
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